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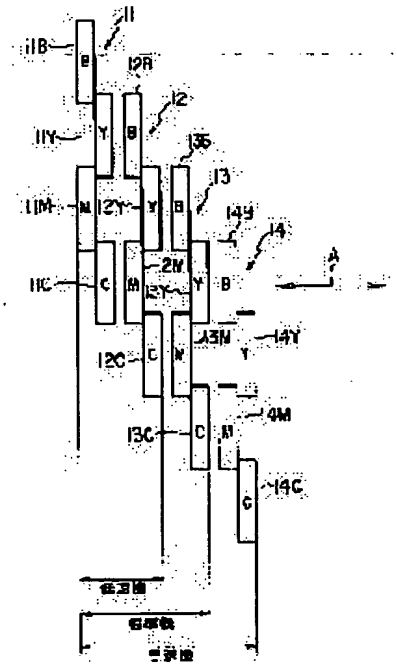
(54) COLOR INK JET HEAD

(57)Abstract:
PROBLEM TO BE SOLVED: To reduce the cost by realizing a high speed machine, a standard machine, a low speed machine, a high resolution machine, a low resolution machine, and the like, easily using a plurality of head blocks of identical arrangement.
SOLUTION: Head units 11B, 11Y, 11M and 11C of different ink color having identical length, number of nozzles and nozzle pitch are arranged in a direction orthogonal to the print direction thus constituting one head block 11. Four head blocks (11-14) are arranged while being shifted by a length substantially corresponding to the length of the head unit in the direction orthogonal to the print direction such that the nozzles of a head unit second from the end and the nozzles of a head unit at the end are arranged in a row between adjacent head blocks thus constituting a color ink jet head.



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* NOTICES *

1.This document has b en translated by computer. So th translation may not r flect the original pr cisely.
2.**** shows the word which can not b translat d.
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CLAIMS

[Claim(s)]
[Claim 1] As opposed to the number of nozzles of the whole in the color of each ink Oneof them n (however n use the beef fat unit which prepared the nozzle of the two or more number of integer) in the same pitch. The color ink-jet head characterized by having arranged in the n directions which the color composition of ink is changed per head unit, constitute the head block of one color number ****** at least in the direction which intersects perpendicularly with the direction which prints the head unit of each color, and print this head block.
[Claim 2] Each head block is a color ink-jet head according to claim 1 characterized by having arranged each head unit so that the pitch between the nozzles of the edge where an adjoining head unit adjoins may become the same as that of the nozzle pitch of a head unit.
[Claim 3] Arrangement of the head unit corresponding to the color composition of each ink in each head block is mad the same. Length [every] sequential staggering which carries out an abbreviation equivalent to the length of a h ad unit in the direction which prints each aforementioned head block, and the direction which intersects p rpendicularly, And the color ink-jet head according to claim 2 characterized by having arranged so that it may stand in a line in the direction which the nozzle of the 2nd head unit and the nozzle of the head unit of an edge print from an edge between adjoining head blocks at a single tier.
[Claim 4] The color ink-jet head according to claim 2 to which arrangement of the head unit corresponding to the color composition of each ink in each head block is made the same, and the nozzle of a head unit is characterized by having arranged each aforementioned head block as only 1/[of a nozzle pitch] n shifted mutually.
[Claim 5] The color ink-jet head according to claim 2 characterized by making it the same color not lap in the direction which prints arrangement of the head unit corresponding to the color composition of each ink in each head block mutually while having arranged so that the nozzle of each head unit may be located in a line in the direction which prints each head block at a single tier.
[Claim 6] Each head block is a color ink-jet head according to claim 1 characterized by having arranged each head unit so that the pitch between the nozzles of the edge where an adjoining head unit adjoins may become the integral multiple of the nozzle pitch of a head unit.
[Claim 7] Arrangement of the head unit corresponding to the color composition of each ink in each head block is mad the same. Length [every] sequential staggering which carries out an abbreviation equivalent to the length of a h ad unit in the direction which prints each aforementioned head block, and the direction which intersects perpendicularly, and In between adjoining head blocks So that the pitch of the other end nozzle of the head unit of th dge in one head block and the end nozzle of the head unit of the edge in the head block of another side may become the same as that of the nozzle pitch of a head unit The color ink-jet head according to claim 6 characterized by having arranged by carrying out.
[Claim 8] The color ink-jet head according to claim 6 to which arrangement of the head unit corresponding to the color composition of each ink in each head block is made the same, and the nozzle of a head unit is characterized by having arranged each aforementioned head block as only 1/[of a nozzle pitch] n shifted mutually.
[Claim 9] As opposed to the number of nozzles of the whole in the color of each ink Oneof them n (however n use the beef fat unit which prepared the nozzle of the two or more number of integer) in the same pitch. Change the color composition of ink per head unit, and the head block of one color number ****** of ink is constituted at least in the direction which intersects perpendicularly with the direction which prints the head unit of each color. It is the color ink-jet head characterized by arranging in the n directions which print this head block, and for each afor mentioned nozzle breathing out two or more small ink drops one by one, and forming one pixel.
[Claim 10] As opposed to the number of nozzles of the whole in the color of each ink Oneof them n (however n use th beef fat unit which prepared the nozzle of the two or more number of integer) in the same pitch. Change the color composition of ink per head unit, and the head block of one color number ****** of ink is constituted at least in the direction which intersects perpendicularly with the direction which prints the head unit of each color. The color ink-j t head charact riz d by the ability to carry out adjustable [of th size of the ** ink drop which arrang s in the n dir ctions which print this head block, and is breathed ut from each afor mention d nozzle by th v lume contr l].

[Translation don .]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the color ink-jet head used for a printer, a copying machine, facsimile apparatus, a plotter, etc.
[0002]
[Description of the Prior Art] Ink-jet technology is widely used for the color printer from the ease of colorization. It is in the inclination which the number of the nozzles which make an ink drop breathe out increases from the demand of high-resolution-izing of printed matter, and improvement in the speed of a print speed in recent years. For this reason, although the large-sized ink-jet head which has very many nozzles is developed, since the yield is bad and serves as cost quantity, one technology which carries out ink-jet head composition is also developed, combining the head unit of the few number of nozzles two or more. It is because this gentleman becomes advantageous in cost. For example, one big head block can be constituted combining the head unit of the few number of nozzles two or more, a color ink-jet head can be constituted from arranging only the number of the colors of the ink which uses this head block, and a function equivalent to the color ink-jet head on which only the number of colors has arrang d the large-sized head can be achieved.
[0003] By the way, with a low-speed machine, although there may be few nozzles of the whole head, in order to realize a high-speed machine, it is necessary to make [many] the number of pixels which increases the number of nozzles of the whole head and can be printed at once, when it constitutes a low-speed machine, a standard machine, and a high-speed machine using a color ink-jet head.
[0004] In the former, when realizing the low-speed machine of a color ink jet printer, a standard machine, and a high-speed machine, as shown in (a) of drawing 14 , (b), and (c) As shown in the thing which changes the length of a head with a low-speed machine, a standard machine, and a high-speed machine and (a) of drawing 15 , (b), and (c), what uses the number of the head units arranged with a low-speed machine, a standard machine, and a high-speed machine, i.e., the head block from which length differs, is known. In addition, as for the inside B of drawing, the head unit which uses black ink is shown, Y shows the head unit which uses yellow ink, M shows the head unit which uses Magenta ink, and C shows the head unit which uses cyano ink.
[0005]
[Problem(s) to be Solved by the Invention] However, since the length of the head used with a low-speed machine, a standard machine, and a high-speed machine differed, what is shown in drawing 14 had to manufacture the head of exclusive use with the low-speed machine, the standard machine, and the high-speed machine, respectively, and had the problem from which economical efficiency serves as cost quantity bad. Moreover, the head block from which length differs with a low-speed machine, a standard machine, and a high-speed machine also in what is shown in drawing 15 , respectively had to be prepared, namely, the head block of exclusive use had to be manufactured, respectively, and there was a problem from which economical efficiency serves as cost quantity bad too.
[0006] This did not ask a low-speed machine, a standard machine, and a high-speed machine, but it increased the number of heads to be used to double precision, even when it locates the nozzle of the head of another side between the nozzle pitches of one head and makes resolution double precision, it will increase the head and head block of exclusive use with a low-speed machine, a standard machine, and a high-speed machine, respectively, and it had the problem from which economical efficiency serves as cost quantity bad too. Then, this invention can realize easily a high-speed machine and standard machine, a low-speed machine, a high resolution machine, a low resolution machine, etc., using the head block of the same composition two or more, and offers the color ink-jet head which is excellent in economical efficiency and can fully reduce cost.
[0007]
[Means for Solving the Problem] As opposed to the number of nozzles of the whole [in / the color of each ink / in inv ntion according to claim 1] The beef fat unit which prepared the nozzle of the number of the 1/n (however, n two or mor integers) in the sam pitch is used. The color composition of ink is changed per head unit, th head block of on color number ****** is c nstituted at least in th dir ction which inters cts perp ndicularly with th dir ction which prints the head unit of ach color, and it is in the c lor ink-j t head arrang d in the n dir ctions which print this h ad block.
[0008] Inv ntion according to claim 2 has each head block in having arranged each h ad unit so that th pitch b tween the nozzl s of the edge where an adjoining head unit adjoins may become the same as that of th nozzl pitch of a head unit in a color ink-jet h ad according to claim 1.

[0009] Invention according to claim 3 is set on a color ink-j t h ad according to claim 2. Arrangement of the head unit corresponding to the color composition of ach ink in each head block is mad the sam . L ngth [very] sequential staggering which carries out an abbr viation equivalent to th length of a head unit in the dir ction which prints each head block, and th direction which int rs cts perpendicularly, And it is in having arrang d so that it may stand in a line in the direction which the nozzle of the 2nd head unit and the nozzle of the head unit of an dg print from an edge betw en adjoining h ad blocks at a singl ti r.
[0010] In a color ink-jet h ad according to claim 2, invention according to claim 4 makes the same arrangement of the head unit corresponding to the color composition of each ink in each head block, and the nozzle of a head unit is mutually about each head block to have arranged, as only 1/[of a nozzle pitch] n shifted.
[0011] In a color ink-jet head according to claim 2, invention according to claim 5 is to have made it the same color not lap in the direction which prints arrangement of the head unit corresponding to the color composition of each ink in each head block mutually while arranging it so that the nozzle of each head unit may be located in a line in the direction which prints each head block at a single tier.
[0012] Invention according to claim 6 has each head block in having arranged each head unit so that the pitch b tween the nozzles of the edge where an adjoining head unit adjoins may become the integral multiple of the nozzle pitch of a head unit in a color ink-jet head according to claim 1.
[0013] Invention according to claim 7 is set on a color ink-jet head according to claim 6. Arrangement of the head unit corresponding to the color composition of each ink in each head block is made the same. Length [every] sequential staggering which carries out an abbreviation equivalent to the length of a head unit in the direction which prints each head block, and the direction which intersects perpendicularly, And it is in having arranged in between adjoining head blocks, as the pitch of the other end nozzle of the head unit of the edge in one head block and the nd nozzle of the head unit of the edge in the head block of another side became the same as that of the nozzle pitch of a head unit.
[0014] In a color ink-jet head according to claim 6, invention according to claim 8 makes the same arrangement of the head unit corresponding to the color composition of each ink in each head block, and the nozzle of a head unit is mutually about each head block to have arranged, as only 1/[of a nozzle pitch] n shifted.
[0015] As opposed to the number of nozzles of the whole [in / the color of each ink / in invention according to claim 9] The beef fat unit which prepared the nozzle of the number of the 1/n (however, n two or more integers) in the same pitch is used. Change the color composition of ink per head unit, and the head block of one color number ****** of ink is constituted at least in the direction which intersects perpendicularly with the direction which prints the head unit of each color. It arranges in the n directions which print this head block, and each nozzle is in the color ink-jet head which carries out the regurgitation of two or more small ink drops one by one, and forms one pixel.
[0016] As opposed to the number of nozzles of the whole [in / the color of each ink / in invention according to claim 10] The beef fat unit which prepared the nozzle of the number of the 1/n (however, n two or more integers) in the same pitch is used. Change the color composition of ink per head unit, and the head block of one color number ****** of ink is constituted at least in the direction which intersects perpendicularly with the direction which prints the head unit of each color. It arranges in the n directions which print this head block, and is in the color ink-jet head which can carry out adjustable [of the size of the ink drop which carries out the regurgitation from each nozzle by the volume control].
[0017]
[Embodiments of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.
(Gestalt of the 1st operation) Drawing 1 is the perspective diagram having shown the important section composition of the printing section, and 1 is a color ink-jet head which constitutes the invention in this application. This color ink-jet head 1 is formed in two parallel slide shafts 2 and 3 free [sliding]. That is, it moves to right and left and the aforementioned color ink-jet head 1 is printed, as the arrow A in drawing shows with each slide shafts 2 and 3. 4 is record media, such as the recording paper, and this record medium 4 is conveyed downward, as the arrow B in drawing shows with the conveyance rollers 5 and 6.
[0018] When it prints, goes and comes back to the aforementioned color ink-jet head 1 one time to the afor mentioned record medium 4, moving to right and left in accordance with each slide shafts 2 and 3, only a predetermined distance is conveyed, and again, the aforementioned record medium 4 will print in the position which th color ink-jet head 1 moved to right and left, and followed the last printing portion, and will print a request to a record medium 4 by repeating this.
[0019] Drawing 2 is drawing having shown roughly the composition of the aforementioned color ink-jet head 1, and this head 1 constitutes one head block using four head units from which the same length, the same number of nozzles, and the ink color that consists of the same nozzle pitch differ, and arranges and constitutes these four head blocks.
[0020] That is, head unit 11C which uses head unit 11M which use h ad unit 11B which us s black ink, head unit 11Y which uses yellow ink, and Mag nta ink, and cyano ink is arrang d in ord r of B (black), Y (y llow), M (Magenta), and C (cyanogen) in th printing dir ction (direction shown by th arrow A in drawing), and th direction which inters cts perpendicularly, and th 1st head block 11 is constitut d.
[0021] Moreov r, head unit 12C which uses head unit 12M which us head unit 12B which uses black ink, head unit 12Y which us s yellow ink, and Mag nta ink, and cyano ink is arranged in th printing directi n and the dir ction

which int rsects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanog n), and the 2nd head block 12 is constituted.
[0022] Mor over, head unit 13C which us s head unit 13M which use head unit 13B which uses black ink, head unit T3Y which uses yellow ink, and Mag nta ink, and cyano ink is arranged in the printing direction and the dir ction which int rsects perp ndicularly in order of B (black), Y (y llow), M (Magenta), and C (cyanogen), and the 3rd head block 13 is constitut d.
[0023] Moreover, head unit 14C which uses h ad unit 14M which use head unit 14B which uses black ink, head unit 14Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 4th head block 14 is constituted.
[0024] Each aforementioned head blocks 11, 12, 13, and 14 As shown in (a) of drawing 3 While arranging the head units 11B-14B which use black ink for one block base 15 side, and the head units 11M-14M which use Magenta ink The head units 11Y-14Y which use yellow ink for an another side side, and the head units 11C-14C which use cyano ink are arranged. And it is made for each [these] head unit to be located in a line in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen).
[0025] And as the portion of X1 surrounded with a circle [of drawing 3 / of (a)] is expanded and shown in (b) of drawing 3 So that the pitch of the nozzle 16 of the other end of the head units 11B-14B which use black ink, and th nozzle 17 of the end of the head units 11Y-14Y which use yellow ink may become equal to each head units 11B-14B and the nozzle pitch P in 11Y-14Y As the other end of the head units 11B-14B and the end section of the head units 11Y-14Y lapped a little, they arrange.
[0026] This is the same also about the relation between the nozzle of the other end of the head units 11Y-14Y which use yellow ink, the nozzle of the end of the head units 11M-14M which use Magenta ink, and the nozzle of the other end of the head units 11M-14M which use Magenta ink and the nozzle of the end of the head units 11C-14C which use cyano ink.
[0027] And it arranges so that it may stand in a line in the direction in which the nozzle of the 2nd head unit and th nozzle of the head unit of an edge print each aforementioned head blocks 11-14 from an edge in the printing dir ction and the direction which intersects perpendicularly between length [every] sequential staggering which carries out an abbreviation equivalent to the length of a head unit, and an adjoining head block at a single tier.
[0028] That is, as shown in drawing 4 , it arranges so that it may stand in a line in the direction which the nozzle 18 of head unit 11Y which uses the yellow ink which is the 2nd head unit from the edge of the 1st head block 11 of the above, and the nozzle 19 of head unit 12B which uses the black ink which is the head unit of the edge of the 2nd head block 12 of the above print at a single tier.
[0029] moreover, similarly The nozzle of head unit 12Y which uses the yellow ink which is the 2nd head unit from the edge of the 2nd head block 12 of the above, and the nozzle of head unit 13B which uses the black ink which is the head unit of the edge of the 3rd head block 13 of the above It arranges so that it may stand in a line in the direction to print at a single tier. The nozzle of head unit 13Y which uses the yellow ink which is the 2nd head unit from the edge of the 3rd head block 13 of the above, and the nozzle of head unit 14B which uses the black ink which is the head unit of the edge of the 4th head block 14 of the above It arranges so that it may stand in a line in th direction to print at a single tier.
[0030] In addition, what is necessary is just to determine the number of nozzles of each head unit in consideration of the field of a facility, the field of the yield, the fewest number as printer specification, or most numbers as printer specification of 1 for an integer etc.
[0031] If the color ink-jet head 1 of such composition is used, B (black), It is arranged in the direction printed even if separated [, respectively] in the direction which the head unit of each color of Y (yellow), M (Magenta), and C (cyanogen) prints, and the four directions which intersect perpendicularly. And since the whole of each nozzle will be arranged at intervals of Pitch P If the ink regurgitation timing from the nozzle of each head unit is controlled in each color, printing will be performed by the width of face which is equivalent to four abbreviation for a head unit in 1 **** of heads 1 operating, and a high-speed machine can be realized.
[0032] Moreover, since the head block of the same composition is used, one head block is reduced, printing will be performed by three pieces, then the width of face which is equivalent to three abbreviation for a head unit in 1 **** of heads operating in this case, and a standard machine can be realized, for example. Furthermore, one head block will be reduced, printing will be performed by two pieces, then the width of face which is equivalent to two abbreviation for a head unit in 1 **** of heads operating in this case, and a low-speed machine can be realized.
[0033] Thus, since the head of a high-speed machine and standard machine and a low-speed machine can be manufactured only by changing the number of use of a head block with the same composition, it is not necessary to manufacture the head block of exclusive use according to a high-speed machine and standard machine and a low-speed machine, and the color ink-jet head which is excellent in economical efficiency and can fully reduce cost can be realized.
[0034] By the way, the amount of ink which carries out th regurgitation from a nozzl in a color ink-jet head may be chang d. For xampl , sinc in the case f the large-siz d print r which prints a poster tc. printed matt r will usually s parate and will b s n, even if ink may sink in to a blot and rear fac of ink, it prints in many cas s by deep concentration. It is b tter f r ther to b no blot of ink, since the printer us d in offic etc. will b s en on th other hand in near, such as a character. mor over — since doubl -sided printing may be carried out — th ink to th rear face of a form — als sinking in — it is mor desirabl for ther to b nothing

[0035] Thus, although a demand which is compl tely diff rent in th amount of ** ink breathed out from a nozzl is performed by the purpose to print and it can also r spond with r cord media, such as a form, t th s d mands for it, it is necessary to chang the amount of ** ink t breathe out into fully coping with it. For this r ason, although th head from which for xample, the diamet r of a nozzl differs for the purpose to be used may be used, in this, it will be said that various kinds of h ads from which the diameter of a nozzle diff rs must be manufactured.
[0036] Then, sinc it can carry out adjustabl [of the amount of **, Inc. br ath d ut from the sam nozzle for 1 pixel printing] if the h ad which can perform gradation control is used, it can respond to various kinds of concentration. There is an ink-jet head of the volume-control formula which controls the size of the ** ink drop which breathes out two or more small ink drops one by one from a nozzle on the ink-jet head which can perform gradation control, forms one pixel (dot), changes an ink-jet head, and the applied voltage and the resistance welding time of the multidrop formula which controls the number of the ** ink drops breathed out at this time, and carries out gradation expression, controls the pressure of an ink room, and is breathed out from a nozzle itself.
[0037] The color ink-jet head 1 mentioned above can apply all of both this method to each head unit of each head block, and each printer of the high-speed machine which used by this the color ink-jet head in which gradation control is possible, a standard machine, and a low-speed machine can realize it easily.
[0038] (Form of the 2nd operation) As shown in drawing 5 , the form of this operation constitutes one head block using four head units which consist of the same length, the same numbers of nozzles, and the same nozzle pitches, arranges these two head blocks and constitutes the color ink-jet head.
[0039] That is, head unit 21C which uses head unit 21M which use head unit 21B which uses black ink, head unit 21Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in order of B (black), Y (yellow), M (Magenta), and C (cyanogen) in the printing direction (the direction of the arrow A in drawing), and the direction which int rsects perpendicularly, and the 1st head block 21 is constituted.
[0040] Moreover, head unit 22C which uses head unit 22M which use head unit 22B which uses black ink, head unit 22Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 2nd head block 22 is constituted.
[0041] And each aforementioned head blocks 21 and 22 were shifted a little in the printing direction and the direction which intersects perpendicularly, and are arranged in it. That is, as the portion of X2 enclosed with with a circl [of drawing 5] is expanded and shown in drawing 6 , as the nozzle 23 of head unit 21B which uses the black ink of the 1st head block 21, and the nozzle 24 of head unit 22B which uses the black ink of the 2nd head block 22 shifted, they arrange only one half of the nozzle pitches P in a head unit mutually.
[0042] Therefore, the relation between the nozzle of other head units 21Y, 21M, and 21C of the 1st head block 21 and the nozzle of other head units 22Y, 22M, and 22C of the 2nd head block 22 comes to shift only one half of the nozzle pitches P of a head unit mutually similarly.
[0043] If it does in this way, since the printing pixel by the 2nd head block 22 will be located between the printing pixels by the 1st head block 21, the pitch which can be printed becomes P/2 and printing in the resolution of the double precision of the resolution of a head block is attained. Thus, a high resolution machine can be easily realized by using two head blocks of the same composition. Moreover, if one head block is accepted and used, a low resolution machine is realizable.
[0044] Moreover, such three head blocks are used, and if the pitch between mutual nozzles shifts and arranges each h ad block only one third of the nozzle pitches P, the pitch which can be printed becomes P/3 and can raise r solution further. Namely, in order to realize the head which is n times the head block whose resolution it carries out and is one n (however, n two or more integers) use about a head block, only the nozzle P pitches1/n of a head unit shift each head block, and the pitch between mutual nozzles should just arrange it.
[0045] Thus, since the head from which various kinds of resolution, such as a high resolution machine and a low r solution machine, differs only by changing the number of use of a head block with the same composition can be manufactured, the color ink-jet head which is excellent in economical efficiency and can fully reduce cost is r alizable.
[0046] In addition, also in this color ink-jet head, it applies any of a multidrop formula and a volume-control formula they are, and the color ink-jet head in which gradation control is possible can be realized.
[0047] (Gestalt of the 3rd operation) As shown in drawing 7 , the gestalt of this operation constitutes one head bl ck using four head units from which the same length, the same number of nozzles, and the ink color that consists of the same nozzle pitch differ, as the ink color of a head unit does not lap in the printing direction mutually, arranges four of this head block, and constitutes the color ink-jet head.
[0048] That is, head unit 31C which uses head unit 31M which use head unit 31B which uses black ink, head unit 31Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in order of B (black), Y (yellow), M (Magenta), and C (cyanogen) in the printing direction (the direction of the arrow A in drawing), and the direction which intersects perpendicularly, and th 1st head block 31 is constituted.
[0049] Moreover, h ad unit 32C which us s head unit 32M which use head unit 32B which uses black ink, head unit 32Y which uses yell w ink, and Magenta ink, and cyano ink is arranged in th printing direction and the directi n which int rs cts p rp ndicularly in order of C (cyanogen), B (black), Y (yellow), and M (Mag nta), and the 2nd head bl ck 32 is constituted.
[0050] Moreover, head unit 33C which us s head unit 33M which us head unit 33B which us s black ink, head unit 33Y which uses yellow ink, and Magenta ink, and cyano ink is arrang d in th printing dir ction and th directi n

which inters cts perpendicularly in order of M (Mag nta), C (cyanog n), B (black), and Y (yellow), and th 3rd head block 33 is constituted.
[0051] Moreov r, head unit 34C which uses h ad unit 34M which us h ad unit 34B which uses black ink, head unit 34Y which uses y llow ink, and Mag nta ink, and cyano ink is arrang d in th printing direction and the direction which inters cts perpendicularly in order of Y (yellow), M (Mag nta), C (cyanogen), and B (black), and the 4th head block 34 is constituted.
[0052] The arrangement relation of each head unit in each aforemention d head blocks 31-34 and the pitch relation of a nozzle are the same as that of the case of drawing 3 mentioned above. And in the printing direction, as each head unit was located in a line, it arranges each aforementioned head blocks 31-34 at the single tier. That is, as the portion of X3 enclosed with with a circle [of drawing 7] is expanded and shown in drawing 8 , it arranges so that th nozzle 35 of head unit 33M which use the Magenta ink of the 3rd head block 33, and the nozzle 36 of head unit 34Y which uses the yellow ink of the 4th head block 34 may be located in a line in the printing direction at a single tier. It arranges so that it may stand in a line in the nozzle 35 and the printing direction of head unit 33M in which the nozzle of head unit 32C which uses the nozzle of head unit 31B which uses the black ink of the 1st head block 31 similarly, and the cyano ink of the 2nd head block 32 also uses the Magenta ink of the 3rd head block 33 at a singl tier.
[0053] If the color ink-jet head of such composition is used, B (black), It is arranged in the direction printed even if separated [, respectively] in the direction which the head unit of each color of Y (yellow), M (Magenta), and C (cyanogen) prints, and the four directions which intersect perpendicularly. And since the whole of each nozzle will b arranged at intervals of Pitch P If the ink regurgitation timing from the nozzle of each head unit is controlled in each color, printing will be performed by the width of face which is equivalent to four abbreviation for a head unit in 1 **** of heads operating, and a high-speed machine can be realized.
[0054] Moreover, since the head block of the same composition is used, one head block is reduced, printing will be performed by three pieces, then the width of face which is equivalent to three abbreviation for a head unit in 1 **** of heads operating in this case, and a standard machine can be realized, for example. Furthermore, one head block will be reduced, printing will be performed by two pieces, then the width of face which is equivalent to two abbreviation for a head unit in 1 **** of heads operating in this case, and a low-speed machine can be realized.
[0055] Thus, since the head of a high-speed machine and standard machine and a low-speed machine can be manufactured only by changing the number of use of the head block from which only the color array of the ink which composition is the same and uses differs, it is not necessary to manufacture the head block of exclusive use according to a high-speed machine and standard machine and a low-speed machine, and the color ink-jet head which is excellent in economical efficiency and can fully reduce cost can be realized. Moreover, since each head block is put in order and arranged in the printing direction at the single tier, without shifting in the printing direction and the direction which intersects perpendicularly, the length of the whole head is made to the length of an abbreviation head block, and can be shortened.
[0056] In addition, also in this color ink-jet head, it applies any of a multidrop formula and a volume-control formula they are, and the color ink-jet head in which gradation control is possible can be realized.
[0057] (Gestalt of the 4th operation) As shown in drawing 9 , the gestalt of this operation constitutes one head block using four head units from which the same length, the same number of nozzles, and the ink color that consists of the same nozzle pitch differ, and arranges and constitutes these four head blocks.
[0058] Namely, head unit 41B which uses black ink, head unit 41Y which uses yellow ink, Head unit 41C which uses h ad unit 41M which use Magenta ink, and cyano ink A predetermined interval is opened in the printing direction (the dir ction of the arrow A in drawing), and the direction which intersects perpendicularly, it arranges in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 1st head block 41 is constituted.
[0059] Moreover, a predetermined interval is opened in the direction which intersects perpendicularly with the printing direction head unit 42C which uses head unit 42M which use head unit 42B which uses black ink, head unit 42Y which uses yellow ink, and Magenta ink, and cyano ink, it arranges in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 2nd head block 42 is constituted.
[0060] Moreover, a predetermined interval is opened in the direction which intersects perpendicularly with the printing direction head unit 43C which uses head unit 43M which use head unit 43B which uses black ink, head unit 43Y which uses yellow ink, and Magenta ink, and cyano ink, it arranges in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 3rd head block 43 is constituted.
[0061] Moreover, a predetermined interval is opened in the direction which intersects perpendicularly with the printing direction head unit 44C which uses head unit 44M which use head unit 44B which uses black ink, head unit 44Y which uses yellow ink, and Magenta ink, and cyano ink, it arranges in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 4th head block 44 is constituted.
[0062] Each aforementioned head blocks 41, 42, 43, and 44 The head units 41B-44B which use black ink for one block bas 45 side as shown in (a) of drawing 10 , The head units 41Y-44Y which use yellow ink, the head units 41M-44M which use Magenta ink, It is mad to stand in a lin in the direction in which the head units 41C-44C which us cyano ink ar arranged, and the printing dir ction and each [these] head unit cross at right angles in order of B (black), Y (y llow), M (Mag nta), and C (cyanogen).
[0063] And as th portion of X4 surround d with a circle [of drawing 10 / of (a)] is expand d and shown in (b) of drawing 10 th integral multiple of the nozzle pitch [in / ach head units 41B-44B, and 41Y-44Y / in th pitch of the nozzle 46 of the other end of the head units 41B-44B which use black ink, and th nozzle 47 of th nd f the

head units 41Y-44Y which us yellow ink] P — that is The other end of the head units 41B-44B and the end s ction of the h ad units 41Y-44Y open and arrang the predetermin d int rval so that it may become m times.
[0064] This is the sam also about the relation b twe n the nozzle of th other end of th head units 41Y-44Y which use yellow ink, the nozzl of the end of th h ad units 41M-44M which use Magenta ink, and th nozzl of the other end of the h ad units 41M-44M which us Magenta ink and the nozzle of th nd of th head units 41C-44C which use cyano ink.
[0065] very [and / th length shorter than the length of a head unit in th dir ction which intersects perpendicularly each aforementioned head blocks 41-44 with the printing direction] — it shifted one by one and arranges As shown in drawing 11 , for example, between the nozzle 46 of the other end of head unit 41B which uses th black ink which is the head unit of the other end of the 1st head block 41 of the above, and the nozzle 47 of the nd of head unit 41Y which uses the following yellow ink Two nozzles 48 by the side of the end of head unit 42B which uses the black ink which is the head unit of the other end of the 2nd head block 42 of the above enter exactly. And as the pitch of a nozzle 46, a nozzle 48 and a nozzle 48, and a nozzle 47 was in agreement with the nozzle pitch P of a head unit exactly, it arranges the 2nd head block 42.
[0066] This arrangement is the same also about arrangement of the 4th head block 44 to the arrangement of the 3rd head block 43 and the 3rd head block 43 to the 2nd head block 42 of the above.
[0067] If the color ink-jet head 1 of such composition is used, B (black), It is arranged in the direction printed even if separated [, respectively] in the direction which the head unit of each color of Y (yellow), M (Magenta), and C (cyanogen) prints, and the four directions which intersect perpendicularly. And since the whole of each nozzle will b arranged at intervals of Pitch P If the ink regurgitation timing from the nozzle of each head unit is controlled in each color, printing will be performed by the width of face which is equivalent to four abbreviation for a head unit in 1 **** of heads 1 operating, and a high-speed machine can be realized.
[0068] Moreover, since the head block of the same composition is used, one head block is reduced, printing will be performed by three pieces, then the width of face which is equivalent to three abbreviation for a head unit in 1 **** of heads operating in this case, and a standard machine can be realized, for example. Furthermore, one head block will be reduced, printing will be performed by two pieces, then the width of face which is equivalent to two abbreviation for a head unit in 1 **** of heads operating in this case, and a low-speed machine can be realized.
[0069] Thus, since the head of a high-speed machine and standard machine and a low-speed machine can be manufactured only by changing the number of use of a head block with the same composition, it is not necessary to manufacture the head block of exclusive use according to a high-speed machine and standard machine and a low-speed machine, and the color ink-jet head which is excellent in economical efficiency and can fully reduce cost can be realized.
[0070] Moreover, since each head blocks 41-44 arrange the head unit of each color to one block base 45 side, th y can narrow width of face of the printing direction, and the width of face of the whole head can also do them narrowly.
[0071] In addition, also in this color ink-jet head, it applies any of a multidrop formula and a volume-control formula they are, and the color ink-jet head in which gradation control is possible can be realized.
[0072] (Gestalt of the 5th operation) As shown in drawing 12 , the gestalt of this operation constitutes one head block using four head units which consist of the same length, the same numbers of nozzles, and the same nozzle pitches, arranges these two head blocks and constitutes the color ink-jet head.
[0073] That is, head unit 51C which uses head unit 51M which use head unit 51B which uses black ink, head unit 51Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in order of B (black), Y (yellow), M (Magenta), and C (cyanogen) in the printing direction (the direction of the arrow A in drawing), and the direction which intersects perpendicularly, and the 1st head block 51 is constituted.
[0074] Moreover, head unit 52C which uses head unit 52M which use head unit 52B which uses black ink, head unit 52Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 2nd head block 52 is constituted.
[0075] And each aforementioned head blocks 51 and 52 were shifted a little in the printing direction and the direction which intersects perpendicularly, and are arranged in it. That is, as the portion of X5 enclosed with with a circl [of drawing 12] is expanded and shown in drawing 13 , as the nozzle 53 of head unit 51B which uses the black ink of the 1st head block 51, and the nozzle 54 of head unit 52B which uses the black ink of the 2nd head block 52 shifted, they arrange only one half of the nozzle pitches P in a head unit mutually.
[0076] Therefore, the relation between the nozzle of other head units 51Y, 51M, and 51C of the 1st head block 51 and the nozzle of other head units 52Y, 52M, and 52C of the 2nd head block 52 comes to shift only one half of the nozzle pitches P of a head unit mutually similarly.
[0077] If it does in this way, since the printing pixel by the 2nd head block 52 will be located between the printing pix ls by the 1st head block 51, the pitch which can be print d b comes P/2 and printing in th resolution of the doubl pr cision of th r solution of a head block is attained. Thus, a high r solution machine can b asily r alized by using two h ad blocks f the same composition. More ver, if one head bl ck is accepted and used, a low r solution machin is r alizabl .
[0078] Moreov r, such thre head blocks are used, and if th pitch b tween mutual nozzles shifts and arranges ach head bl ck only on third of the nozzl pitch s P, the pitch which can be print d b com s P/3 and can rais resolution further. Nam ly, in order to r aliz th head which is n times th h ad block whose r solution it carries

ut and is one n (how ver, n two r mor integers) us about a head block, only th nozzle P pitches1/n of a h ad unit shift ach h ad block, and the pitch between mutual nozzles should just arrange it.
[0079] Thus, since the h ad from which various kinds of resolution, such as a high r solution machin and a low resolution machine, differs only by changing th number f us of a h ad block with the sam c mposition can be manufactured, th color ink-jet head which is excell nt in conomical ffici ncy and can fully r duc cost is realizable.
[0080] In addition, also in this color ink-jet h ad, it appli s any of a multidrop formula and a volume-control formula th y are, and the color ink-jet head in which gradation control is possible can be realized.
[0081]
[Effect of the Invention] According to invention given [each] in a claim, a high-speed machine and standard machine, a low-speed machine, a high resolution machine, a low resolution machine, etc. can be realized easily, using the head block of the same composition two or more, it excels in economical efficiency, and cost can fully be reduced.

[Translation done.]

* NOTICES *

TECHNICAL FIELD

[Th technical field to which invention belongs] this invention relates to the color ink-jet head used for a printer, a copying machine, facsimile apparatus, a plotter, etc.

[Translation done.]

PRIOR ART

[Description of the Prior Art] Ink-jet technology is widely used for the color printer from the ease of colorization. It is in the inclination which the number of the nozzles which make an ink drop breathe out increases from the demand of high-resolution-izing of printed matter, and improvement in the speed of a print speed in recent years. For this reason, although the large-sized ink-jet head which has very many nozzles is developed, since the yield is bad and serv s as cost quantity, one technology which carries out ink-jet head composition is also developed, combining th head unit of the few number of nozzles two or more. It is because this gentleman becomes advantageous in cost. For example, one big head block can be constituted combining the head unit of the few number of nozzles two or more, a color ink-jet head can be constituted from arranging only the number of the colors of the ink which uses this head block, and a function equivalent to the color ink-jet head on which only the number of colors has arrang d the large-sized head can be achieved.

[0003] By the way, with a low-speed machine, although there may be few nozzles of the whole head, in order to realize a high-speed machine, it is necessary to make [many] the number of pixels which increases the number of nozzles of the whole head and can be printed at once, when it constitutes a low-speed machine, a standard machine, and a high-speed machine using a color ink-jet head.

[0004] In the former, when realizing the low-speed machine of a color ink jet printer, a standard machine, and a high-speed machine, as shown in (a) of drawing 14 , (b), and (c) As shown in the thing which changes the length of a head with a low-speed machine, a standard machine, and a high-speed machine and (a) of drawing 15 , (b), and (c), what uses the number of the head units arranged with a low-speed machine, a standard machine, and a high-speed machine, i.e., the head block from which length differs, is known. In addition, as for the inside B of drawing, the head unit which uses black ink is shown, Y shows the head unit which uses yellow ink, M shows the head unit which uses Mag nta ink, and C shows the head unit which uses cyano ink.

[Translation done.]

*NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] According to invention given [each] in a claim, a high-speed machine and standard machine, a low-speed machine, a high resolution machine, a low resolution machine, etc. can be realized easily, using the head block of the same composition two or more, it excels in economical efficiency, and cost can fully be reduced.

[Translation done.]

* NOTICES *

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, since the length of the head used with a low-speed machine, a standard machine, and a high-speed machine differed, what is shown in drawing 14 had to manufacture the head of xclusive use with the low-speed machine, the standard machine, and the high-speed machine, respectively, and had the problem from which economical efficiency serves as cost quantity bad. Moreover, the head block from which length differs with a low-speed machine, a standard machine, and a high-speed machine also in what is shown in drawing 15 , respectively had to be prepared, namely, the head block of exclusive use had to be manufactured, respectively, and there was a problem from which economical efficiency serves as cost quantity bad too.
[0006] This did not ask a low-speed machine, a standard machine, and a high-speed machine, but it increased the number of heads to be used to double precision, even when it locates the nozzle of the head of another side between the nozzle pitches of one head and makes resolution double precision, it will increase the head and head block of exclusive use with a low-speed machine, a standard machine, and a high-speed machine, respectively, and it had the problem from which economical efficiency serves as cost quantity bad too. Then, this invention can r alize easily a high-speed machine and standard machine, a low-speed machine, a high resolution machine, a low r solution machine, etc., using the head block of the same composition two or more, and offers the color ink-jet head which is excellent in economical efficiency and can fully reduce cost.

[Translation done.]

MEANS

[M ans for Solving the Problem] As opposed to the number of nozzles of the whole [in / the color of each ink / in inv ntion according to claim 1] The beef fat unit which prepared the nozzle of the number of the 1/n (however, n two or more integers) in the same pitch is used. The color composition of ink is changed per head unit, the head block of one color number ****** is constituted at least in the direction which intersects perpendicularly with the direction which prints the head unit of each color, and it is in the color ink-jet head arranged in the n directions which print this head block.
[0008] Invention according to claim 2 has each head block in having arranged each head unit so that the pitch between the nozzles of the edge where an adjoining head unit adjoins may become the same as that of the nozzle pitch of a head unit in a color ink-jet head according to claim 1.
[0009] Invention according to claim 3 is set on a color ink-jet head according to claim 2. Arrangement of the head unit corresponding to the color composition of each ink in each head block is made the same. Length [every] s quential staggering which carries out an abbreviation equivalent to the length of a head unit in the direction which prints each head block, and the direction which intersects perpendicularly, And it is in having arranged so that it may stand in a line in the direction which the nozzle of the 2nd head unit and the nozzle of the head unit of an edge print from an edge between adjoining head blocks at a single tier.
[0010] In a color ink-jet head according to claim 2, invention according to claim 4 makes the same arrangement of th head unit corresponding to the color composition of each ink in each head block, and the nozzle of a head unit is mutually about each head block to have arranged, as only 1/[of a nozzle pitch] n shifted.
[0011] In a color ink-jet head according to claim 2, invention according to claim 5 is to have made it the same color not lap in the direction which prints arrangement of the head unit corresponding to the color composition of each ink in each head block mutually while arranging it so that the nozzle of each head unit may be located in a line in the dir ction which prints each head block at a single tier.
[0012] Invention according to claim 6 has each head block in having arranged each head unit so that the pitch b tween the nozzles of the edge where an adjoining head unit adjoins may become the integral multiple of the nozzl pitch of a head unit in a color ink-jet head according to claim 1.
[0013] Invention according to claim 7 is set on a color ink-jet head according to claim 6. Arrangement of the head unit corresponding to the color composition of each ink in each head block is made the same. Length [every] sequential staggering which carries out an abbreviation equivalent to the length of a head unit in the direction which prints each head block, and the direction which intersects perpendicularly, And it is in having arranged in between adjoining head blocks, as the pitch of the other end nozzle of the head unit of the edge in one head block and the end nozzle of the head unit of the edge in the head block of another side became the same as that of the nozzle pitch of a head unit.
[0014] In a color ink-jet head according to claim 6, invention according to claim 8 makes the same arrangement of the head unit corresponding to the color composition of each ink in each head block, and the nozzle of a head unit is mutually about each head block to have arranged, as only 1/[of a nozzle pitch] n shifted.
[0015] As opposed to the number of nozzles of the whole [in / the color of each ink / in invention according to claim 9] The beef fat unit which prepared the nozzle of the number of the 1/n (however, n two or more integers) in th same pitch is used. Change the color composition of ink per head unit, and the head block of one color number ****** of ink is constituted at least in the direction which intersects perpendicularly with the direction which prints th head unit of each color. It arranges in the n directions which print this head block, and each nozzle is in the color ink-jet head which breathes out two or more small ink drops one by one, and forms one pixel.
[0016] As opposed to the number of nozzles of the whole [in / the color of each ink / in invention according to claim 10] The beef fat unit which prepared the nozzle of the number of the 1/n (however, n two or more integers) in the same pitch is used. Change the color composition of ink per head unit, and the head block of one color number ****** of ink is constituted at least in the direction which intersects perpendicularly with the direction which prints the head unit of each color. It arrang s in the n directions which print this head block, and is in the color ink-j t head which can carry out adjustable [of th size of th ink drop which carri s out the regurgitation from ach nozzle by th volume control].
[0017]
[Embodiments of th Invention] H r after, th form of operation of this invention is explain d with refer nce to a drawing.
(Form of the 1st operation) Drawing 1 is th persp ctive diagram having shown th important secti n composition of

the printing section, and 1 is a color ink-j t head which constitutes the invention in this application. This color ink-jet head 1 is formed in two parall l slide shafts 2 and 3 free [sliding]. That is, it mov s to right and left and th aforemention d color ink-jet head 1 is printed, as th arrow A in drawing shows with ach slide shafts 2 and 3. 4 is record media, such as th rec rding paper, and this r cord m dium 4 is conv yed downward, as the arr w B in drawing shows with the conv yanc rollers 5 and 6.

[0018] When it prints, go s and com s back to the afor mentioned color ink-jet h ad 1 on tim to the aforemention d record medium 4, moving to right and l ft in accordance with ach slide shafts 2 and 3, only a predetermined distance is conveyed, and again, the aforementioned record medium 4 will print in the position which th color ink-jet head 1 moved to right and left, and followed the last printing portion, and will print a request to a r cord medium 4 by repeating this.

[0019] Drawing 2 is drawing having shown roughly the composition of the aforementioned color ink-jet head 1, and this head 1 constitutes one head block using four head units from which the same length, the same number of nozzles, and the ink color that consists of the same nozzle pitch differ, and arranges and constitutes these four head blocks.

[0020] That is, head unit 11C which uses head unit 11M which use head unit 11B which uses black ink, head unit 11Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in order of B (black), Y (yellow), M (Magenta), and C (cyanogen) in the printing direction (direction shown by the arrow A in drawing), and the direction which intersects perpendicularly, and the 1st head block 11 is constituted.

[0021] Moreover, head unit 12C which uses head unit 12M which use head unit 12B which uses black ink, head unit 12Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 2nd head block 12 is constituted.

[0022] Moreover, head unit 13C which uses head unit 13M which use head unit 13B which uses black ink, head unit 13Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 3rd head block 13 is constituted.

[0023] Moreover, head unit 14C which uses head unit 14M which use head unit 14B which uses black ink, head unit 14Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 4th head block 14 is constituted.

[0024] Each aforementioned head blocks 11, 12, 13, and 14 As shown in (a) of drawing 3 While arranging the head units 11B-14B which use black ink for one block base 15 side, and the head units 11M-14M which use Magenta ink The head units 11Y-14Y which use yellow ink for an another side side, and the head units 11C-14C which use cyano ink are arranged. And it is made for each [these] head unit to be located in a line in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen).

[0025] And as the portion of X1 surrounded with a circle [of drawing 3 / of (a)] is expanded and shown in (b) of drawing 3 So that the pitch of the nozzle 16 of the other end of the head units 11B-14B which use black ink, and th nozzle 17 of the end of the head units 11Y-14Y which use yellow ink may become equal to each head units 11B-14B and the nozzle pitch P in 11Y-14Y As the other end of the head units 11B-14B and the end section of the head units 11Y-14Y lapped a little, they arrange.

[0026] This is the same also about the relation between the nozzle of the other end of the head units 11Y-14Y which use yellow ink, the nozzle of the end of the head units 11M-14M which use Magenta ink, and the nozzle of the other end of the head units 11M-14M which use Magenta ink and the nozzle of the end of the head units 11C-14C which use cyano ink.

[0027] And it arranges so that it may stand in a line in the direction in which the nozzle of the 2nd head unit and th nozzle of the head unit of an edge print each aforementioned head blocks 11-14 from an edge in the printing direction and the direction which intersects perpendicularly between length [every] sequential staggering which carries out an abbreviation equivalent to the length of a head unit, and an adjoining head block at a single tier.

[0028] That is, as shown in drawing 4 , it arranges so that it may stand in a line in the direction which the nozzle 18 of head unit 11Y which uses the yellow ink which is the 2nd head unit from the edge of the 1st head block 11 of the above, and the nozzle 19 of head unit 12B which uses the black ink which is the head unit of the edge of the 2nd h ad block 12 of the above print at a single tier.

[0029] moreover, similarly The nozzle of head unit 12Y which uses the yellow ink which is the 2nd head unit from th edge of the 2nd head block 12 of the above, and the nozzle of head unit 13B which uses the black ink which is th head unit of the edge of the 3rd head block 13 of the above It arranges so that it may stand in a line in the dir ction to print at a single tier. The nozzle of head unit 13Y which uses the yellow ink which is the 2nd head unit fr m the edge of the 3rd head block 13 of the above, and the nozzle of head unit 14B which uses the black ink which is th h ad unit of th edg f the 4th head block 14 of the ab ve It arranges so that it may stand in a line in the dir ction to print at a single tier.

[0030] In addition, what is necessary is just to determine the number of nozzles of each head unit in c nsideration of the field of a facility, th field of the yield, th fewest numb r as printer specification, or most numb rs as printer specification of 1 for an int ger tc.

[0031] If the c lor ink-j t head 1 of such composition is used, B (black), It is arranged in the direction print d ven if s parat d [, respectiv ly] in the direction which th head unit of each color of Y (yellow), M (Magenta), and C

(cyanogen) prints, and the four dir ctions which intersect perp ndicularly. And since the whol of each nozzle will b arranged at intervals of Pitch P If the ink **** timing from th nozzle of each head unit is controll d in each color, printing will b performed by th width of face which is quivalent to four abbreviation for a head unit in 1 **** of heads 1 operating, and a high-speed machine can b r aliz d.

[0032] Moreover, sinc th head block of th sam composition is used, on head block is reduc d, printing will be performed by thr pieces, th n the width of face which is equival nt t thr abbreviation for a h ad unit in 1 **** of heads operating in this cas , and a standard machin can b realiz d, for example. Furthermor , one head block will be reduced, printing will be performed by two pieces, then the width of face which is equivalent to two abbr viation for a head unit in 1 **** of heads operating in this case, and a low-speed machine can be realized.

[0033] Thus, since the head of a high-speed machine and standard machine and a low-speed machine can be manufactured only by changing the number of use of a head block with the same composition, it is not necessary to manufacture the head block of exclusive use according to a high-speed machine and standard machine and a low-sp ed machine, and the color ink-jet head which is excellent in economical efficiency and can fully reduce cost can b realized.

[0034] By the way, the amount of ** ink breathed out from a nozzle in a color ink-jet head may be changed. For example, since in the case of the large-sized printer which prints a poster etc. printed matter will usually separate and will be seen, even if ink may sink in to a blot and rear face of ink, it prints in many cases by deep concentration. It is better for there to be no blot of ink, since the printer used in office etc. will be seen on the other hand in near, such as a character. moreover — since double-sided printing may be carried out — the ink to the rear face of a form — also sinking in — it is more desirable for there to be nothing

[0035] Thus, although a demand which is completely different in the amount of ** ink breathed out from a nozzle is performed by the purpose to print and it can also respond with record media, such as a form, to these demands for it, it is necessary to change the amount of ** ink to breathe out into fully coping with it. For this reason, although th head from which for example, the diameter of a nozzle differs for the purpose to be used may be used, in this, it will be said that various kinds of heads from which the diameter of a nozzle differs must be manufactured.

[0036] Then, since it can carry out adjustable [of the amount of **, Inc. breathed out from the same nozzle for 1 pix l printing] if the head which can perform gradation control is used, it can respond to various kinds of concentration. There is an ink-jet head of the volume-control formula which controls the size of the ** ink drop which breathes out two or more small ink drops one by one from a nozzle on the ink-jet head which can perform gradation control, forms one pixel (dot), changes an ink-jet head, and the applied voltage and the resistance welding time of the multidrop formula which controls the number of the ** ink drops breathed out at this time, and carries out gradation expression, controls the pressure of an ink room, and is breathed out from a nozzle itself.

[0037] The color ink-jet head 1 mentioned above can apply all of both this method to each head unit of each head block, and each printer of the high-speed machine which used by this the color ink-jet head in which gradation control is possible, a standard machine, and a low-speed machine can realize it easily.

[0038] (Form of the 2nd operation) As shown in drawing 5 , the form of this operation constitutes one head block using four head units which consist of the same length, the same numbers of nozzles, and the same nozzle pitches, arranges these two head blocks and constitutes the color ink-jet head.

[0039] That is, head unit 21C which uses head unit 21M which use head unit 21B which uses black ink, head unit 21Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in order of B (black), Y (yellow), M (Magenta), and C (cyanogen) in the printing direction (the direction of the arrow A in drawing), and the direction which int rsects perpendicularly, and the 1st head block 21 is constituted.

[0040] Moreover, head unit 22C which uses head unit 22M which use head unit 22B which uses black ink, head unit 22Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 2nd head block 22 is constituted.

[0041] And each aforementioned head blocks 21 and 22 were shifted a little in the printing direction and the dir ction which intersects perpendicularly, and are arranged in it. That is, as the portion of X2 enclosed with with a circle [of drawing 5] is expanded and shown in drawing 6 , as the nozzle 23 of head unit 21B which uses the black ink of the 1st head block 21, and the nozzle 24 of head unit 22B which uses the black ink of the 2nd head block 22 shifted, they arrange only one half of the nozzle pitches P in a head unit mutually.

[0042] Therefore, the relation between the nozzle of other head units 21Y, 21M, and 21C of the 1st head block 21 and the nozzle of other head units 22Y, 22M, and 22C of the 2nd head block 22 comes to shift only one half of the nozzle pitches P of a head unit mutually similarly.

[0043] If it does in this way, since the printing pixel by the 2nd head block 22 will be located between the printing pix ls by the 1st head block 21, the pitch which can be printed becomes P/2 and printing in the resolution of the double precision of the resolution of a head block is attained. Thus, a high resolution machine can be easily realized by using two h ad blocks of th same composition. Moreover, if one head block is accepted and us d, a low resolution machine is r alizable.

[0044] Moreov r, such thr head blocks are us d, and if th pitch betwe n mutual nozzles shifts and arranges each head block only one third of th nozzle pitch s P, th pitch which can b printed becomes P/3 and can raise resolution further. Nam ly, in order to realize th head which is n times the head block wh s resolution it carri s out and is one n (how ver, n two or mor int gers) us about a head block, only the nozzl P pitch s1/n f a h ad unit shift each head block, and the pitch between mutual nozzles should just arrang it.

[0045] Thus, since the head from which various kinds of r solution, such as a high r solution machin and a low resolution machine, differs only by changing the number of us of a h ad block with the same composition can be manufactured, th color ink-j t h ad which is excellent in economical fficiency and can fully reduce cost is realizable.
[0046] In addition, also in this color ink-jet head, it appli s any of a multidrop formula and a volume-contr l formula they are, and th color ink-jet head in which gradation control is possibl can b r aliz d.
[0047] (Form of the 3rd operation) As shown in drawing 7 , th form of this operation constitut s one h ad block using four head units from which the same length, the same number of nozzles, and the ink color that consists of the same nozzle pitch differ, as the ink color of a head unit does not lap in the printing direction mutually, arranges four of this head block, and constitutes the color ink-jet head.
[0048] That is, head unit 31C which uses head unit 31M which use head unit 31B which uses black ink, head unit 31Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in order of B (black), Y (yellow), M (Magenta), and C (cyanogen) in the printing direction (the direction of the arrow A in drawing), and the direction which intersects perpendicularly, and the 1st head block 31 is constituted.
[0049] Moreover, head unit 32C which uses head unit 32M which use head unit 32B which uses black ink, head unit 32Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of C (cyanogen), B (black), Y (yellow), and M (Magenta), and the 2nd head block 32 is constituted.
[0050] Moreover, head unit 33C which uses head unit 33M which use head unit 33B which uses black ink, head unit 33Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of M (Magenta), C (cyanogen), B (black), and Y (yellow), and the 3rd head block 33 is constituted.
[0051] Moreover, head unit 34C which uses head unit 34M which use head unit 34B which uses black ink, head unit 34Y which uses yellow ink, and Magenta ink, and cyano ink is arranged in the printing direction and the direction which intersects perpendicularly in order of Y (yellow), M (Magenta), C (cyanogen), and B (black), and the 4th head block 34 is constituted.
[0052] The arrangement relation of each head unit in each aforementioned head blocks 31-34 and the pitch relation of a nozzle are the same as that of the case of drawing 3 mentioned above. And in the printing direction, as each head unit was located in a line, it arranges each aforementioned head blocks 31-34 at the single tier. That is, as the portion of X3 enclosed with with a circle [of drawing 7] is expanded and shown in drawing 8 , it arranges so that the nozzle 35 of head unit 33M which use the Magenta ink of the 3rd head block 33, and the nozzle 36 of head unit 34Y which uses the yellow ink of the 4th head block 34 may be located in a line in the printing direction at a single ti r. It arranges so that it may stand in a line in the nozzle 35 and the printing direction of head unit 33M in which the nozzle of head unit 32C which uses the nozzle of head unit 31B which uses the black ink of the 1st head block 31 similarly, and the cyano ink of the 2nd head block 32 also uses the Magenta ink of the 3rd head block 33 at a single tier.
[0053] If the color ink-jet head of such composition is used, B (black), It is arranged in the direction printed even if s parated [, respectively] in the direction which the head unit of each color of Y (yellow), M (Magenta), and C (cyanogen) prints, and the four directions which intersect perpendicularly. And since the whole of each nozzle will b arranged at intervals of Pitch P If the ink **** timing from the nozzle of each head unit is controlled in each color, printing will be performed by the width of face which is equivalent to four abbreviation for a head unit in 1 **** of h ads operating, and a high-speed machine can be realized.
[0054] Moreover, since the head block of the same composition is used, one head block is reduced, printing will b performed by three pieces, then the width of face which is equivalent to three abbreviation for a head unit in 1 **** of heads operating in this case, and a standard machine can be realized, for example. Furthermore, one head block will be reduced, printing will be performed by two pieces, then the width of face which is equivalent to two abbreviation for a head unit in 1 **** of heads operating in this case, and a low-speed machine can be realized.
[0055] Thus, since the head of a high-speed machine and standard machine and a low-speed machine can be manufactured only by changing the number of use of the head block from which only the color array of the ink which composition is the same and uses differs, it is not necessary to manufacture the head block of exclusive use according to a high-speed machine and standard machine and a low-speed machine, and the color ink-jet head which is excellent in economical efficiency and can fully reduce cost can be realized. Moreover, since each head block is put in order and arranged in the printing direction at the single tier, without shifting in the printing direction and the direction which intersects perpendicularly, the length of the whole head is made to the length of an abbreviation head block, and can be shortened.
[0056] In addition, also in this color ink-jet head, it applies any of a multidrop formula and a volume-control formula they are, and the color ink-jet head in which gradation control is possible can be realized.
[0057] (Form of th 4th operation) As shown in drawing 9 , th form of this operation constitutes one head block using four head units from which the sam length, th same numb r f nozzl s, and th ink color that consists of the same nozzl pitch differ, and arranges and c nstitutes these four head blocks.
[0058] Namely, head unit 41B which uses black ink, head unit 41Y which uses y llow ink, Head unit 41C which us s head unit 41M which use Mag nta ink, and cyano ink A predetermined int rval is p n d in the printing dir ction (the dir ction of th arrow A in drawing), and the dir ction which inters cts perp ndicularly, it arrang s in rder of B (black), Y (yellow), M (Mag nta), and C (cyanog n), and th 1st h ad block 41 is constituted.

[0059] Moreover, a predetermined interval is op n d in th direction which intersects perp ndicularly with the printing direction head unit 42C which us s h ad unit 42M which us head unit 42B which uses black ink, head unit 42Y which uses yellow ink, and Magenta ink, and cyano ink, it arranges in ord r of B (black), Y (yellow), M (Mag nta), and C (cyanogen), and th 2nd head block 42 is constitut d.
[0060] Moreover, a pred termined interval is op n d in th direction which inters cts perp ndicularly with the printing dir ction head unit 43C which uses h ad unit 43M which us head unit 43B which us s black ink, h ad unit 43Y which us s yellow ink, and Magenta ink, and cyano ink, it arrang s in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 3rd head block 43 is constituted.
[0061] Moreover, a predetermined interval is opened in the direction which intersects perpendicularly with the printing direction head unit 44C which uses head unit 44M which use head unit 44B which uses black ink, head unit 44Y which uses yellow ink, and Magenta ink, and cyano ink, it arranges in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and the 4th head block 44 is constituted.
[0062] Each aforementioned head blocks 41, 42, 43, and 44 The head units 41B-44B which use black ink for one block base 45 side as shown in (a) of drawing 10 , The head units 41Y-44Y which use yellow ink, the head units 41M-44M which use Magenta ink, It is made to stand in a line in the direction in which the head units 41C-44C which use cyano ink are arranged, and the printing direction and each [these] head unit cross at right angles in order of B (black), Y (yellow), M (Magenta), and C (cyanogen).
[0063] And as the portion of X4 surrounded with a circle [of drawing 10 / of (a)] is expanded and shown in (b) of drawing 10 the integral multiple of the nozzle pitch [in / each head units 41B-44B, and 41Y-44Y / in the pitch of the nozzle 46 of the other end of the head units 41B-44B which use black ink, and the nozzle 47 of the end of th head units 41Y-44Y which use yellow ink] P -- that is The other end of the head units 41B-44B and the end section of the head units 41Y-44Y open and arrange the predetermined interval so that it may become m times.
[0064] This is the same also about the relation between the nozzle of the other end of the head units 41Y-44Y which use yellow ink, the nozzle of the end of the head units 41M-44M which use Magenta ink, and the nozzle of th oth r end of the head units 41M-44M which use Magenta ink and the nozzle of the end of the head units 41C-44C which use cyano ink.
[0065] every [and / the length shorter than the length of a head unit in the direction which intersects perpendicularly each aforementioned head blocks 41-44 with the printing direction] -- it shifted one by one and arranges As shown in drawing 11 , for example, between the nozzle 46 of the other end of head unit 41B which uses the black ink which is the head unit of the other end of the 1st head block 41 of the above, and the nozzle 47 of th nd of head unit 41Y which uses the following yellow ink Two nozzles 48 by the side of the end of head unit 42B which uses the black ink which is the head unit of the other end of the 2nd head block 42 of the above enter exactly. And as the pitch of a nozzle 46, a nozzle 48 and a nozzle 48, and a nozzle 47 was in agreement with the nozzle pitch P of a head unit exactly, it arranges the 2nd head block 42.
[0066] This arrangement is the same also about arrangement of the 4th head block 44 to the arrangement of the 3rd head block 43 and the 3rd head block 43 to the 2nd head block 42 of the above.
[0067] If the color ink-jet head 1 of such composition is used, B (black), It is arranged in the direction printed even if s parated [, respectively] in the direction which the head unit of each color of Y (yellow), M (Magenta), and C (cyanogen) prints, and the four directions which intersect perpendicularly. And since the whole of each nozzle will be arranged at intervals of Pitch P If the ink **** timing from the nozzle of each head unit is controlled in each color, printing will be performed by the width of face which is equivalent to four abbreviation for a head unit in 1 **** of heads 1 operating, and a high-speed machine can be realized.
[0068] Moreover, since the head block of the same composition is used, one head block is reduced, printing will be p rformed by three pieces, then the width of face which is equivalent to three abbreviation for a head unit in 1 **** of heads operating in this case, and a standard machine can be realized, for example. Furthermore, one head block will be reduced, printing will be performed by two pieces, then the width of face which is equivalent to two abbreviation for a head unit in 1 **** of heads operating in this case, and a low-speed machine can be realized.
[0069] Thus, since the head of a high-speed machine and standard machine and a low-speed machine can be manufactured only by changing the number of use of a head block with the same composition, it is not necessary t manufacture the head block of exclusive use according to a high-speed machine and standard machine and a low-speed machine, and the color ink-jet head which is excellent in economical efficiency and can fully reduce cost can be r alized.
[0070] Moreover, since each head blocks 41-44 arrange the head unit of each color to one block base 45 side, th y can narrow width of face of the printing direction, and the width of face of the whole head can also do them narrowly.
[0071] In addition, also in this color ink-jet head, it applies any of a multidrop formula and a volume-control formula th y are, and the color ink-jet head in which gradation control is possible can be realized.
[0072] (Gestalt of the 5th op ration) As shown in drawing 12 , the gestalt of this op ration constitut s one head block using four h ad units which consist of the sam length, th same numbers of nozzles, and the same nozzl pitches, arranges these two head blocks and constitutes th color ink-j t head.
[0073] That is, h ad unit 51C which uses head unit 51M which us head unit 51B which uses black ink, head unit 51Y which us s y llow ink, and Mag nta ink, and cyano ink is arrang d in order of B (black), Y (yellow), M (Magenta), and C (cyanogen) in the printing dir ction (the direction of the arrow A in drawing), and the direction which intersects perp ndicularly, and the 1st h ad block 51 is constitut d.

[0074] Moreov r, head unit 52C which uses head unit 52M which us h ad unit 52B which uses black ink, head unit 52Y which us s y llow ink, and Mag nta ink, and cyano ink is arrang d in the printing dir ction and th direction which intersects perpendicularly in order of B (black), Y (yellow), M (Magenta), and C (cyanogen), and th 2nd head block 52 is constituted.
[0075] And each aforementioned head blocks 51 and 52 w re shifted a littl in the printing dir ction and th direction which intersects perp ndicularly, and are arrang d in it. That is, as the portion of X5 enclosed with with a circle [of drawing 12] is expand d and shown in drawing 13 , as th nozzle 53 of head unit 51B which uses the black ink of the 1st head block 51, and the nozzle 54 of head unit 52B which uses the black ink of the 2nd head block 52 shifted, they arrange only one half of the nozzle pitches P in a head unit mutually.
[0076] Therefore, the relation between the nozzle of other head units 51Y, 51M, and 51C of the 1st head block 51 and the nozzle of other head units 52Y, 52M, and 52C of the 2nd head block 52 comes to shift only one half of the nozzle pitches P of a head unit mutually similarly.
[0077] If it does in this way, since the printing pixel by the 2nd head block 52 will be located between the printing pixels by the 1st head block 51, the pitch which can be printed becomes P/2 and printing in the resolution of the double precision of the resolution of a head block is attained. Thus, a high resolution machine can be easily realized by using two head blocks of the same composition. Moreover, if one head block is accepted and used, a low resolution machine is realizable.
[0078] Moreover, such three head blocks are used, and if the pitch between mutual nozzles shifts and arranges each head block only one third of the nozzle pitches P, the pitch which can be printed becomes P/3 and can raise resolution further. Namely, in order to realize the head which is n times the head block whose resolution it carries out and is one n (however, n two or more integers) use about a head block, only the nozzle P pitches1/n of a head unit shift each head block, and the pitch between mutual nozzles should just arrange it.
[0079] Thus, since the head from which various kinds of resolution, such as a high resolution machine and a low resolution machine, differs only by changing the number of use of a head block with the same composition can be manufactured, the color ink-jet head which is excellent in economical efficiency and can fully reduce cost is realizable.
[0080] In addition, also in this color ink-jet head, it applies any of a multidrop formula and a volume-control formula they are, and the color ink-jet head in which gradation control is possible can be realized.

[Translation done.]

DESCRIPTION OF DRAWINGS

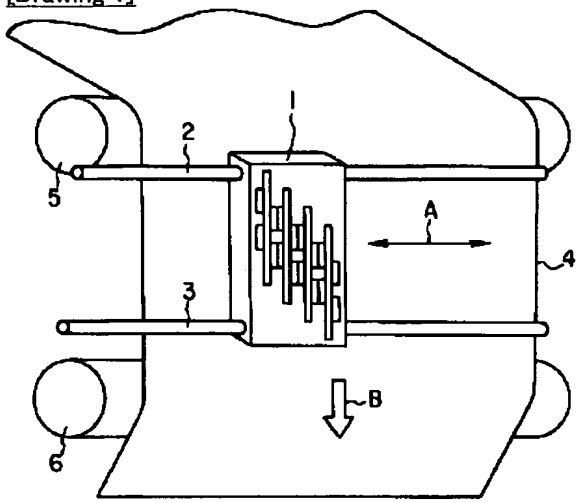
[Brief Description of the Drawings]
[Drawing 1] The perspective diagram having shown the important section composition of the printing section concerning the gestalt of operation of the 1st of this invention.
[Drawing 2] Drawing showing the outline composition of the color ink-jet head in the gestalt of this operation.
[Drawing 3] Drawing showing the composition of the head block in the gestalt of this operation.
[Drawing 4] Drawing for explaining the nozzle location relation between each head block in the gestalt of this operation.
[Drawing 5] Drawing showing the outline composition of the color ink-jet head in the gestalt of operation of the 2nd of this invention.
[Drawing 6] Drawing for explaining the nozzle location relation between each head block in the gestalt of this operation.
[Drawing 7] Drawing showing the outline composition of the color ink-jet head in the gestalt of operation of the 3rd of this invention.
[Drawing 8] Drawing for explaining the nozzle location relation between each head block in the gestalt of this operation.
[Drawing 9] Drawing showing the outline composition of the color ink-jet head in the gestalt of operation of the 4th of this invention.
[Drawing 10] Drawing showing the composition of the head block in the gestalt of this operation.
[Drawing 11] Drawing for explaining the nozzle location relation between each head block in the gestalt of this operation.
[Drawing 12] Drawing showing the outline composition of the color ink-jet head in the gestalt of operation of the 5th of this invention.
[Drawing 13] Drawing for explaining the nozzle location relation between each head block in the gestalt of this op ration.
[Drawing 14] Drawing showing the example of 1 composition of the conventional color ink-jet head.
[Drawing 15] Drawing showing other examples of composition of the conventional color ink-jet head.
[Description of Notations]
1 — Color ink-jet head
11-14 — Head block
11B, 12B, 13B, 14B — Head unit which uses black ink
11Y, 12Y, 13Y, 14Y — Head unit which uses yellow ink
11M, 12M, 13M, 14M — Head unit which uses Magenta ink
11C, 12C, 13C, 14C — Head unit which uses cyanogen ink
16, 17, 18, 19 — Nozzle

[Translation done.]

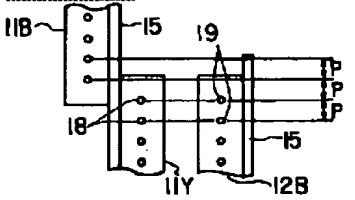
* NOTICES *

DRAWINGS

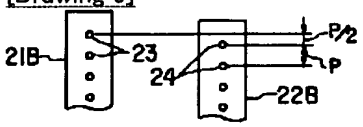
[Drawing 1]



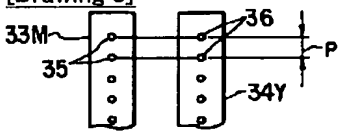
[Drawing 4]



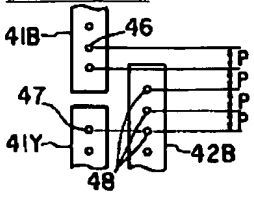
[Drawing 6]



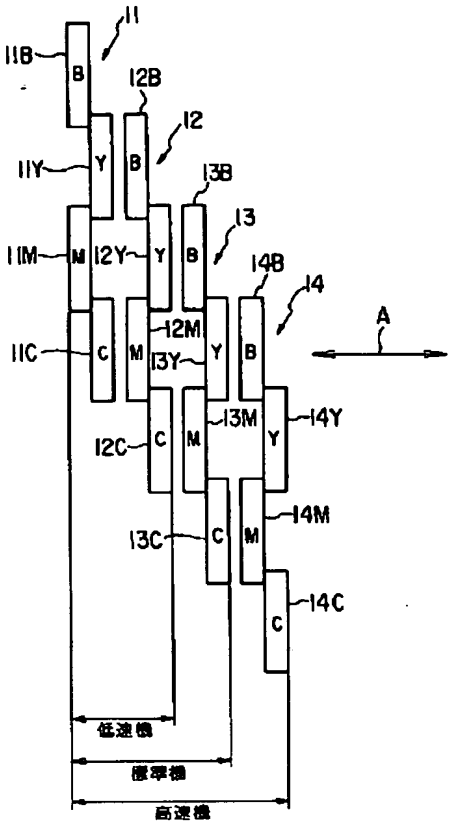
[Drawing 8]



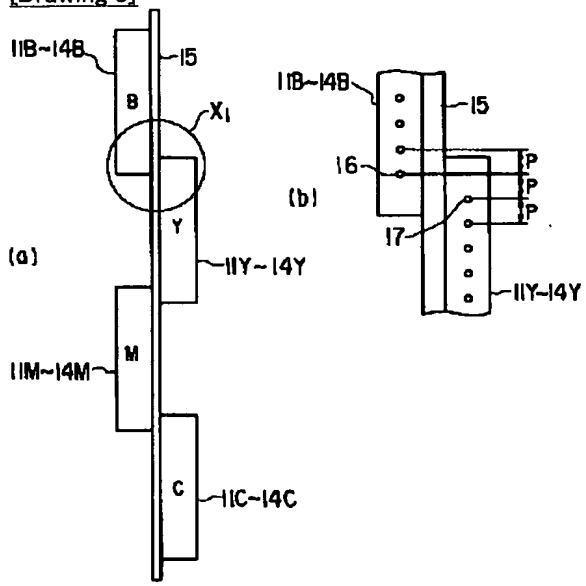
[Drawing 11]



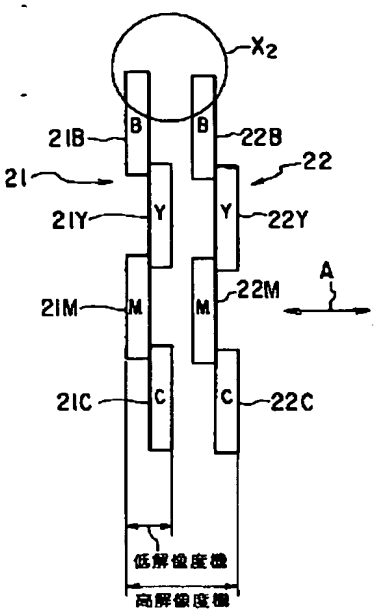
[Drawing 2]



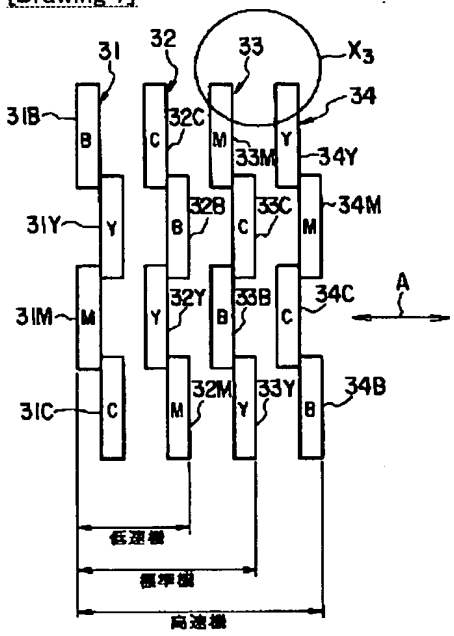
[Drawing 3]



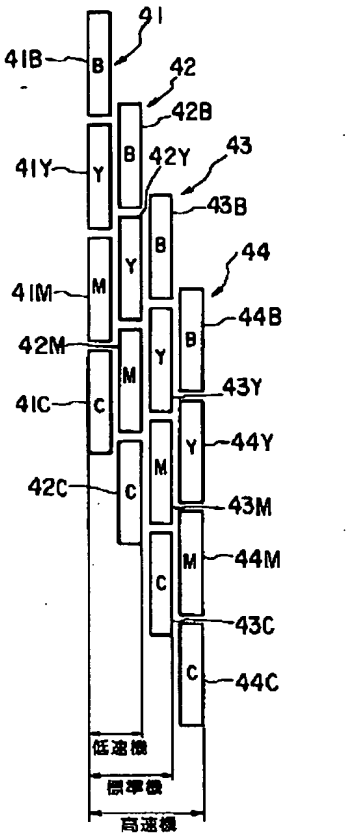
[Drawing 5]



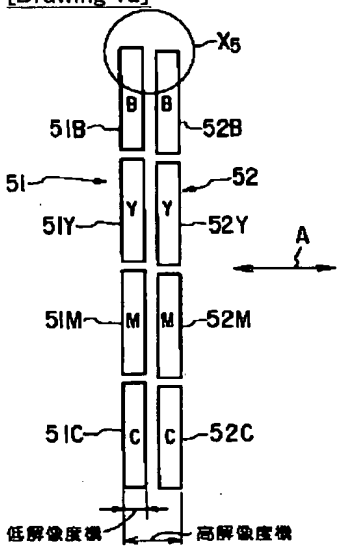
[Drawing 7]



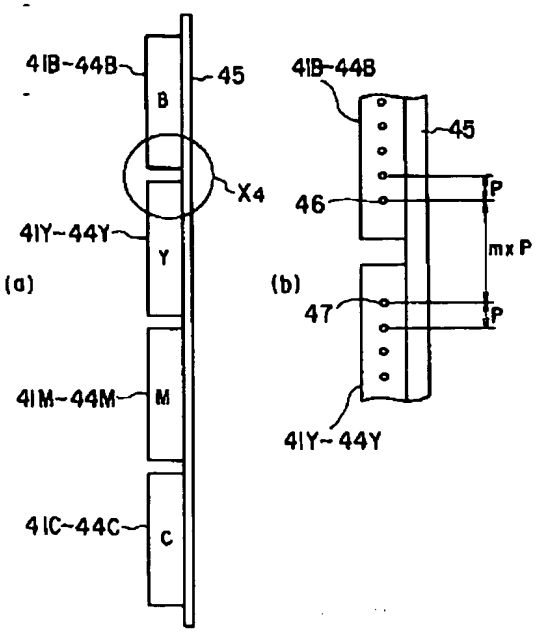
[Drawing 9]



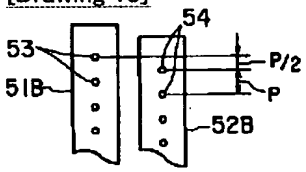
[Drawing 12]



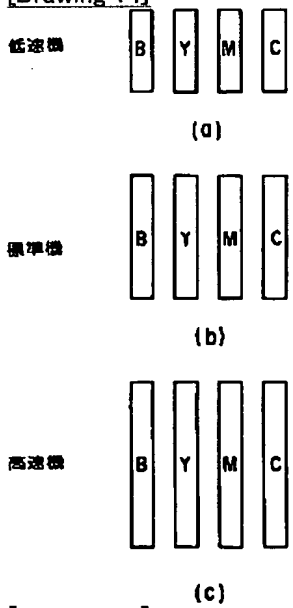
[Drawing 10]



[Drawing 13]

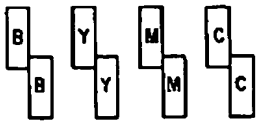


[Drawing 14]



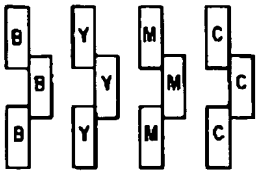
[Drawing 15]

低速機



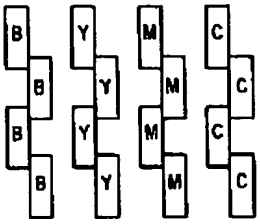
(a)

標準



(b)

高速機



(c)

[Translation done.]

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2/01			１０１Ｚ	２Ｃ０５７
2/21			１０１Ａ	
2/205			１０３Ｘ	

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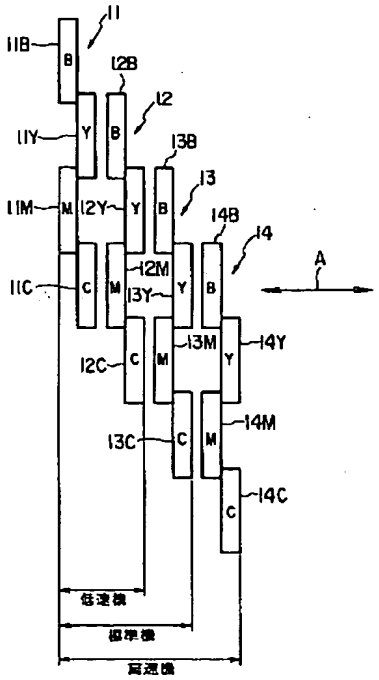
最終頁に続く

(54)【発明の名称】　カラーインクジェットヘッド

(57)【要約】
【課題】　同一構成のヘッドブロックを複数個使用して高速機、標準機、低速機や高解像度機、低解像度機などを容易に実現してコストを低減する。
【解決手段】　同一の長さ、同一のノズル数、同一のノズルピッチからなるインク色の異なるヘッドユニット１１Ｂ、１１Ｙ、１１Ｍ、１１Ｃを印刷方向と直交する方向に配置して１つのヘッドブロック１１を構成する。そして、このヘッドブロックを４個（１１～１４）、印刷方向と直交する方向にヘッドユニットの長さに略相当する長さずつ順次ずらし、かつ、隣接するヘッドブロック間において端から２つ目のヘッドユニットのノズルと端のヘッドユニットのノズルが印刷する方向に一列に並ぶように配置してカラーインクジェットヘッドを構成する。



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【特許請求の範囲】

【請求項１】　それぞれのインクの色における全体のノズル数に対して、その１／ｎ（但し、ｎは２以上の整数）の数のノズルを同一ピッチで設けたヘットユニットを用い、インクの色構成をヘッドユニット単位で異ならせ、各色のヘッドユニットを印刷する方向とは直交する方向に少なくとも色数並べて１つのヘッドブロックを構成し、このヘッドブロックを印刷する方向にｎ個配置したことを特徴とするカラーインクジェットヘッド。

【請求項２】　各ヘッドブロックは、各ヘッドユニットを、隣接するヘッドユニットの隣接する端のノズル間のピッチがヘッドユニットのノズルピッチと同一になるように配置したことを特徴とする請求項１記載のカラーインクジェットヘッド。

【請求項３】　各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を同一とし、前記各ヘッドブロックを印刷する方向と直交する方向にヘッドユニットの長さに略相当する長さずつ順次ずらし、かつ、隣接するヘッドブロック間において端から２つ目のヘッドユニットのノズルと端のヘッドユニットのノズルが印刷する方向に一列に並ぶように配置したことを特徴とする請求項２記載のカラーインクジェットヘッド。

【請求項４】　各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を同一とし、前記各ヘッドブロックをヘッドユニットのノズルが互いにノズルピッチの１／ｎだけずれるようにして配置したことを特徴とする請求項２記載のカラーインクジェットヘッド。

【請求項５】　各ヘッドブロックを印刷する方向にそれぞれのヘッドユニットのノズルが一列に並ぶように配置するとともに、各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を印刷する方向に互いに同一の色が重ならないようにしたことを特徴とする請求項２記載のカラーインクジェットヘッド。

【請求項６】　各ヘッドブロックは、各ヘッドユニットを、隣接するヘッドユニットの隣接する端のノズル間のピッチがヘッドユニットのノズルピッチの整数倍になるように配置したことを特徴とする請求項１記載のカラーインクジェットヘッド。

【請求項７】　各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を同一とし、前記各ヘッドブロックを印刷する方向と直交する方向にヘッドユニットの長さに略相当する長さずつ順次ずらし、かつ、隣接するヘッドブロック間において一方のヘッドブロックにおける端のヘッドユニットの他端ノズルと他方のヘッドブロックにおける端のヘッドユニットの一端ノズルとのピッチがヘッドユニットのノズルピッチと同一になるようにして配置したことを特徴とする請求項６記載のカラーインクジェットヘッド。

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【請求項８】　各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を同一とし、前記各ヘッドブロックをヘッドユニットのノズルが互いにノズルピッチの１／ｎだけずれるようにして配置したことを特徴とする請求項６記載のカラーインクジェットヘッド。

【請求項９】　それぞれのインクの色における全体のノズル数に対して、その１／ｎ（但し、ｎは２以上の整数）の数のノズルを同一ピッチで設けたヘットユニットを用い、インクの色構成をヘッドユニット単位で異ならせ、各色のヘッドユニットを印刷する方向とは直交する方向に少なくともインクの色数並べて１つのヘッドブロックを構成し、このヘッドブロックを印刷する方向にｎ個配置し、前記各ノズルは複数の小さなインク液滴を順次吐出して１つの画素を形成することを特徴とするカラーインクジェットヘッド。

【請求項１０】　それぞれのインクの色における全体のノズル数に対して、その１／ｎ（但し、ｎは２以上の整数）の数のノズルを同一ピッチで設けたヘットユニットを用い、インクの色構成をヘッドユニット単位で異ならせ、各色のヘッドユニットを印刷する方向とは直交する方向に少なくともインクの色数並べて１つのヘッドブロックを構成し、このヘッドブロックを印刷する方向にｎ個配置し、ボリュームコントロールによって前記各ノズルから吐出するインク液滴の大きさを可変できることを特徴とするカラーインクジェットヘッド。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、プリンタ、複写機、ファクシミリ装置、プロッタ等に使用されるカラーインクジェットヘッドに関する。

【０００２】

【従来の技術】インクジェット技術はカラー化の容易性からカラープリンタに広く利用されている。近年では、印刷物の高解像度化、印刷速度の高速化の要求から、インク液滴を吐出させるノズルの数が増加する傾向にある。このため、非常に多くのノズルを有する大型のインクジェットヘッドが開発されているが、歩留まりが悪く、コスト高となるため、少ないノズル数のヘッドユニットを複数組み合わせて１つのインクジェットヘッド構成する技術も開発されている。この方がコスト的に有利になるからである。例えば、少ないノズル数のヘッドユニットを複数組み合わせて１つの大きなヘッドブロックを構成し、このヘッドブロックを使用するインクの色の数だけ配置することでカラーインクジェットヘッドを構成することができ、大型のヘッドを色の数だけ配置したカラーインクジェットヘッドと同等の機能を果たすことができる。

【０００３】ところで、カラーインクジェットヘッドを

使用して低速機、標準機、高速機を構成する場合、低速機ではヘッド全体のノズル数が少なくてよいが、高速機を実現するためにはヘッド全体のノズル数を増やして一度に印刷できる画素数を多くする必要がある。

【０００４】従来において、カラーインクジェットプリンタの低速機、標準機、高速機を実現する場合、図１４の(a)、(b)、(c)に示すように、低速機、標準機、高速機でヘッドの長さを異ならせるもの、また、図１５の(a)、(b)、(c)に示すように、低速機、標準機、高速機で配置するヘッドユニットの数、すなわち、長さの異なるヘッドブロックを使用するものが知られている。なお、図中Ｂはブラックインクを使用するヘッドユニットを示し、Ｙはイエローインクを使用するヘッドユニットを示し、Ｍはマゼンタインクを使用するヘッドユニットを示し、Ｃはシアンインクを使用するヘッドユニットを示している。

【０００５】

【発明が解決しようとする課題】しかしながら、図１４に示すものは、低速機、標準機、高速機で使用するヘッドの長さが異なるため、低速機、標準機、高速機でそれぞれ専用のヘッドを製造しなければならず、経済性が悪くコスト高となる問題があった。また、図１５に示すものにおいても低速機、標準機、高速機でそれぞれ長さの異なるヘッドブロックを用意しなければならず、すなわち、それぞれ専用のヘッドブロックを製造しなければならず、やはり経済性が悪くコスト高となる問題があった。

【０００６】このことは、低速機、標準機、高速機を問わず、使用するヘッド数を２倍に増やし、一方のヘッドのノズルピッチ間に他方のヘッドのノズルを位置させて解像度を２倍にするような場合でも低速機、標準機、高速機でそれぞれ専用のヘッドやヘッドブロックを増やすことになり、やはり経済性が悪くコスト高となる問題があった。そこで、本発明は、同一構成のヘッドブロックを複数個使用して高速機、標準機、低速機や高解像度機、低解像度機などを容易に実現でき、経済性に優れコストを充分に低減できるカラーインクジェットヘッドを提供する。

【０００７】

【課題を解決するための手段】請求項１記載の発明は、それぞれのインクの色における全体のノズル数に対して、その１／ｎ（但し、ｎは２以上の整数）の数のノズルを同一ピッチで設けたヘットユニットを用い、インクの色構成をヘッドユニット単位で異ならせ、各色のヘッドユニットを印刷する方向とは直交する方向に少なくとも色数並べて１つのヘッドブロックを構成し、このヘッドブロックを印刷する方向にｎ個配置したカラーインクジェットヘッドにある。

【０００８】請求項２記載の発明は、請求項１記載のカラーインクジェットヘッドにおいて、各ヘッドブロックは、各ヘッドユニットを、隣接するヘッドユニットの隣接する端のノズル間のピッチがヘッドユニットのノズルピッチと同一になるように配置したことにある。

【０００９】請求項３記載の発明は、請求項２記載のカラーインクジェットヘッドにおいて、各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を同一とし、各ヘッドブロックを印刷する方向と直交する方向にヘッドユニットの長さに略相当する長さずつ順次ずらし、かつ、隣接するヘッドブロック間において端から２つ目のヘッドユニットのノズルと端のヘッドユニットのノズルが印刷する方向に一列に並ぶように配置したことにある。

【００１０】請求項４記載の発明は、請求項２記載のカラーインクジェットヘッドにおいて、各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を同一とし、各ヘッドブロックをヘッドユニットのノズルが互いにノズルピッチの１／ｎだけずれるようにして配置したことにある。

【００１１】請求項５記載の発明は、請求項２記載のカラーインクジェットヘッドにおいて、各ヘッドブロックを印刷する方向にそれぞれのヘッドユニットのノズルが一列に並ぶように配置するとともに、各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を印刷する方向に互いに同一の色が重ならないようにしたことにある。

【００１２】請求項６記載の発明は、請求項１記載のカラーインクジェットヘッドにおいて、各ヘッドブロックは、各ヘッドユニットを、隣接するヘッドユニットの隣接する端のノズル間のピッチがヘッドユニットのノズルピッチの整数倍になるように配置したことにある。

【００１３】請求項７記載の発明は、請求項６記載のカラーインクジェットヘッドにおいて、各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を同一とし、各ヘッドブロックを印刷する方向と直交する方向にヘッドユニットの長さに略相当する長さずつ順次ずらし、かつ、隣接するヘッドブロック間において一方のヘッドブロックにおける端のヘッドユニットの他端ノズルと他方のヘッドブロックにおける端のヘッドユニットの一端ノズルとのピッチがヘッドユニットのノズルピッチと同一になるようにして配置したことにある。

【００１４】請求項８記載の発明は、請求項６記載のカラーインクジェットヘッドにおいて、各ヘッドブロックにおけるそれぞれのインクの色構成に対応するヘッドユニットの配置を同一とし、各ヘッドブロックをヘッドユニットのノズルが互いにノズルピッチの１／ｎだけずれるようにして配置したことにある。

【００１５】請求項９記載の発明は、それぞれのインクの色における全体のノズル数に対して、その１／ｎ（但し、ｎは２以上の整数）の数のノズルを同一ピッチで設

けたヘットユニットを用い、インクの色構成をヘッドユニット単位で異ならせ、各色のヘッドユニットを印刷する方向とは直交する方向に少なくともインクの色数並べて１つのヘッドブロックを構成し、このヘッドブロックを印刷する方向にｎ個配置し、各ノズルは複数の小さなインク液滴を順次吐出して１つの画素を形成するカラーインクジェットヘッドにある。

【００１６】請求項１０記載の発明は、それぞれのインクの色における全体のノズル数に対して、その１／ｎ（但し、ｎは２以上の整数）の数のノズルを同一ピッチで設けたヘットユニットを用い、インクの色構成をヘッドユニット単位で異ならせ、各色のヘッドユニットを印刷する方向とは直交する方向に少なくともインクの色数並べて１つのヘッドブロックを構成し、このヘッドブロックを印刷する方向にｎ個配置し、ボリュームコントロールによって各ノズルから吐出するインク液滴の大きさを可変できるカラーインクジェットヘッドにある。

【００１７】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照して説明する。

（第１の実施の形態）図１は印刷部の要部構成を示した斜視図で、１は本願発明を構成するカラーインクジェットヘッドである。このカラーインクジェットヘッド１は２本の平行なスライド軸２，３に摺動自在に設けられている。すなわち、前記カラーインクジェットヘッド１は各スライド軸２，３により図中矢印Ａで示すように左右に移動して印刷するようになっている。４は記録紙等の記録媒体で、この記録媒体４は搬送ローラ５，６によって図中矢印Ｂで示すように下方向に搬送されるようになっている。

【００１８】前記カラーインクジェットヘッド１は各スライド軸２，３に沿って左右に移動しながら前記記録媒体４に印刷を行い、１往復すると前記記録媒体４が所定の距離だけ搬送し、再びカラーインクジェットヘッド１が左右に移動して前回の印刷部分に連続した位置に印刷を行い、これを繰り返すことで記録媒体４に対して所望の印刷を行うことになる。

【００１９】図２は前記カラーインクジェットヘッド１の構成を概略的に示した図で、このヘッド１は、同一の長さ、同一のノズル数、同一のノズルピッチからなるインク色の異なるヘッドユニットを４個使用して１つのヘッドブロックを構成し、このヘッドブロックを４個配置して構成している。

【００２０】すなわち、ブラックインクを使用するヘッドユニット１１Ｂ、イエローインクを使用するヘッドユニット１１Ｙ、マゼンタインクを使用するヘッドユニット１１Ｍ、シアンインクを使用するヘッドユニット１１Ｃを、印刷方向（図中矢印Ａで示す方向）と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第１のヘッドブロック１１を構成している。

【００２１】また、ブラックインクを使用するヘッドユニット１２Ｂ、イエローインクを使用するヘッドユニット１２Ｙ、マゼンタインクを使用するヘッドユニット１２Ｍ、シアンインクを使用するヘッドユニット１２Ｃを、印刷方向と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第２のヘッドブロック１２を構成している。

【００２２】また、ブラックインクを使用するヘッドユニット１３Ｂ、イエローインクを使用するヘッドユニット１３Ｙ、マゼンタインクを使用するヘッドユニット１３Ｍ、シアンインクを使用するヘッドユニット１３Ｃを、印刷方向と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第３のヘッドブロック１３を構成している。

【００２３】また、ブラックインクを使用するヘッドユニット１４Ｂ、イエローインクを使用するヘッドユニット１４Ｙ、マゼンタインクを使用するヘッドユニット１４Ｍ、シアンインクを使用するヘッドユニット１４Ｃを、印刷方向と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第４のヘッドブロック１４を構成している。

【００２４】前記各ヘッドブロック１１，１２，１３，１４は、図３の(a)に示すように、ブロックベース１５の一方の側にブラックインクを使用するヘッドユニット１１Ｂ～１４Ｂとマゼンタインクを使用するヘッドユニット１１Ｍ～１４Ｍを配置するとともに他方の側にイエローインクを使用するヘッドユニット１１Ｙ～１４Ｙとシアンインクを使用するヘッドユニット１１Ｃ～１４Ｃを配置し、かつ、これら各ヘッドユニットが印刷方向と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並ぶようにしている。

【００２５】そして、図３の(b)に図３の(a)の丸で囲んだX_1の部分を拡大して示すように、ブラックインクを使用するヘッドユニット１１Ｂ～１４Ｂの他端のノズル１６とイエローインクを使用するヘッドユニット１１Ｙ～１４Ｙの一端のノズル１７とのピッチが各ヘッドユニット１１Ｂ～１４Ｂ，１１Ｙ～１４Ｙにおけるノズルピッチｐと等しくなるように、ヘッドユニット１１Ｂ～１４Ｂの他端部とヘッドユニット１１Ｙ～１４Ｙの一端部とが若干重なるようにして配置している。

【００２６】これは、イエローインクを使用するヘッドユニット１１Ｙ～１４Ｙの他端のノズルとマゼンタインクを使用するヘッドユニット１１Ｍ～１４Ｍの一端のノズル、並びにマゼンタインクを使用するヘッドユニット１１Ｍ～１４Ｍの他端のノズルとシアンインクを使用するヘッドユニット１１Ｃ～１４Ｃの一端のノズルとの関係についても同様である。

【００２７】そして、前記各ヘッドブロック１１～１４

を印刷方向と直交する方向にヘッドユニットの長さに略相当する長さずつ順次ずらし、かつ、隣接するヘッドブロック間において端から２つ目のヘッドユニットのノズルと端のヘッドユニットのノズルが印刷する方向に一列に並ぶように配置している。

【００２８】すなわち、図４に示すように、前記第１のヘッドブロック１１の端から２つ目のヘッドユニットであるイエローインクを使用するヘッドユニット１１Ｙのノズル１８と前記第２のヘッドブロック１２の端のヘッドユニットであるブラックインクを使用するヘッドユニット１２Ｂのノズル１９が印刷する方向に一列に並ぶように配置している。

【００２９】また、同様に、前記第２のヘッドブロック１２の端から２つ目のヘッドユニットであるイエローインクを使用するヘッドユニット１２Ｙのノズルと前記第３のヘッドブロック１３の端のヘッドユニットであるブラックインクを使用するヘッドユニット１３Ｂのノズルが印刷する方向に一列に並ぶように配置し、前記第３のヘッドブロック１３の端から２つ目のヘッドユニットであるイエローインクを使用するヘッドユニット１３Ｙのノズルと前記第４のヘッドブロック１４の端のヘッドユニットであるブラックインクを使用するヘッドユニット１４Ｂのノズルが印刷する方向に一列に並ぶように配置している。

【００３０】なお、各ヘッドユニットのノズル数は、設備の面、歩留まりの面、プリンタ仕様としてもっとも少ない数、あるいはプリンタ仕様としてもっとも多い数の整数分の１などを考慮して決定すればよい。

【００３１】このような構成のカラーインクジェットヘッド１を使用すれば、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の各色のヘッドユニットが印刷する方向にそれぞれ離れていても印刷する方向と直交する方向に４個配置され、しかも各ノズルがすべてピッチＰの間隔で配列されることになるので、それぞれの色において各ヘッドユニットのノズルからのインク吐出タイミングを制御すればヘッド１が１往復動作することでヘッドユニットの略４個分に相当する幅で印刷が行なわれることになり、高速機が実現できる。

【００３２】また、同一構成のヘッドブロックを使用しているので、例えば、ヘッドブロックを１個減らして３個とすれば、この場合にはヘッドが１往復動作することでヘッドユニットの略３個分に相当する幅で印刷が行なわれることになり、標準機が実現できる。さらに、ヘッドブロックを１個減らして２個とすれば、この場合にはヘッドが１往復動作することでヘッドユニットの略２個分に相当する幅で印刷が行なわれることになり、低速機が実現できる。

【００３３】このように、構成が同一のヘッドブロックの使用数を異ならせるのみで高速機、標準機、低速機のヘッドが製造できるので、高速機、標準機、低速機に合わせて専用のヘッドブロックを製造する必要はなく、経済性に優れコストを充分に低減できるカラーインクジェットヘッドが実現できる。

【００３４】ところで、カラーインクジェットヘッドにおいてノズルから吐出するインク量を変える場合がある。例えば、ポスター等を印刷する大判のプリンタの場合、印刷物は通常離れて見ることになるので、インクの滲みや裏面までインクが染み込むようなことがあっても濃い濃度で印刷する場合が多い。一方、オフィス等で使用されるプリンタは、文字など近くで見ることになるのでインクの滲みは無い方がよい。また、両面印刷することもあるので用紙の裏面へのインクの染み込みも無い方が望ましい。

【００３５】このように、印刷する目的によってノズルから吐出するインク量に全く異なる要求が行われ、これらの要求に対して用紙などの記録媒体で対応することもできるが、充分に対処するには吐出するインク量を変える必要がある。このため、使用する目的によって例えばノズル径の異なるヘッドを使用する場合があるが、しかし、これではノズル径の異なる各種のヘッドを製造しなければならないということになる。

【００３６】そこで、階調制御のできるヘッドを使用すれば同一のノズルから１画素印刷のために吐出するインクの量を可変できるので各種の濃度に対応できることになる。階調制御ができるインクジェットヘッドには、ノズルから複数の小さなインク液滴を順次吐出して１つの画素（ドット）を形成し、このとき吐出するインク液滴の数を制御して階調表現するマルチドロップ式のインクジェットヘッドと、印加電圧や通電時間を変えてインク室の圧力を制御してノズルから吐出するインク液滴の大きさそのものを制御するボリュームコントロール式のインクジェットヘッドがある。

【００３７】前述したカラーインクジェットヘッド１は、各ヘッドブロックの各ヘッドユニットに対してこの両方式の何れも適用することができ、これにより、階調制御が可能なカラーインクジェットヘッドを使用した高速機、標準機、低速機のそれぞれのプリンタが容易に実現できることになる。

【００３８】（第２の実施の形態）この実施の形態は、図５に示すように、同一の長さ、同一のノズル数、同一のノズルピッチからなるヘッドユニットを４個使用して１つのヘッドブロックを構成し、このヘッドブロックを２個配置してカラーインクジェットヘッドを構成している。

【００３９】すなわち、ブラックインクを使用するヘッドユニット２１Ｂ、イエローインクを使用するヘッドユニット２１Ｙ、マゼンタインクを使用するヘッドユニット２１Ｍ、シアンインクを使用するヘッドユニット２１Ｃを、印刷方向（図中矢印Ａの方向）と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼン

タ）、Ｃ（シアン）の順に並べて第１のヘッドブロック２１を構成している。

【００４０】また、ブラックインクを使用するヘッドユニット２２Ｂ、イエローインクを使用するヘッドユニット２２Ｙ、マゼンタインクを使用するヘッドユニット２２Ｍ、シアンインクを使用するヘッドユニット２２Ｃを、印刷方向と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第２のヘッドブロック２２を構成している。

【００４１】そして、前記各ヘッドブロック２１，２２を印刷方向と直交する方向に若干ずらして配置している。すなわち、図６に図５の丸で囲んだX_2の部分を拡大して示すように、第１のヘッドブロック２１のブラックインクを使用するヘッドユニット２１Ｂのノズル２３と第２のヘッドブロック２２のブラックインクを使用するヘッドユニット２２Ｂのノズル２４が互いにヘッドユニットにおけるノズルピッチＰの１／２だけずれるようにして配置している。

【００４２】従って、第１のヘッドブロック２１の他のヘッドユニット２１Ｙ、２１Ｍ、２１Ｃのノズルと第２のヘッドブロック２２の他のヘッドユニット２２Ｙ、２２Ｍ、２２Ｃのノズルとの関係も同様に互いにヘッドユニットのノズルピッチＰの１／２だけずれるようになる。

【００４３】このようにすれば、第１のヘッドブロック２１による印刷画素の間に第２のヘッドブロック２２による印刷画素が位置することになるので印刷可能なピッチはＰ／２となり、ヘッドブロックの解像度の２倍の解像度での印刷が可能になる。このように、同一構成のヘッドブロックを２個使用することで高解像度機が容易に実現できる。また、ヘッドブロックを１個のみ使用すれば低解像度機が実現できる。

【００４４】また、このようなヘッドブロックを３個使用し、各ヘッドブロックを互いのノズル間のピッチがノズルピッチＰの１／３だけずらして配置すれば印刷可能なピッチはＰ／３となり、さらに解像度を高めることができる。すなわち、ヘッドブロックをｎ（但し、ｎは２以上の整数）使用して解像度が１つのヘッドブロックのｎ倍のヘッドを実現するには、各ヘッドブロックを互いのノズル間のピッチがヘッドユニットのノズルピッチＰの１／ｎだけずらして配置すればよい。

【００４５】このように、構成が同一のヘッドブロックの使用数を異ならせるのみで高解像度機や低解像度機など各種の解像度の異なるヘッドが製造できるので、経済性に優れコストを充分に低減できるカラーインクジェットヘッドが実現できる。

【００４６】なお、このカラーインクジェットヘッドにおいても、マルチドロップ式及びボリュームコントロール式の何れかを適用して階調制御が可能なカラーインクジェットヘッドを実現できる。

【００４７】（第３の実施の形態）この実施の形態は、図７に示すように、同一の長さ、同一のノズル数、同一のノズルピッチからなるインク色の異なるヘッドユニットを４個使用して１つのヘッドブロックを構成し、このヘッドブロックを印刷方向にヘッドユニットのインク色が互いに重ならないようにして４個配置してカラーインクジェットヘッドを構成している。

【００４８】すなわち、ブラックインクを使用するヘッドユニット３１Ｂ、イエローインクを使用するヘッドユニット３１Ｙ、マゼンタインクを使用するヘッドユニット３１Ｍ、シアンインクを使用するヘッドユニット３１Ｃを、印刷方向（図中矢印Ａの方向）と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第１のヘッドブロック３１を構成している。

【００４９】また、ブラックインクを使用するヘッドユニット３２Ｂ、イエローインクを使用するヘッドユニット３２Ｙ、マゼンタインクを使用するヘッドユニット３２Ｍ、シアンインクを使用するヘッドユニット３２Ｃを、印刷方向と直交する方向に、Ｃ（シアン）、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）の順に並べて第２のヘッドブロック３２を構成している。

【００５０】また、ブラックインクを使用するヘッドユニット３３Ｂ、イエローインクを使用するヘッドユニット３３Ｙ、マゼンタインクを使用するヘッドユニット３３Ｍ、シアンインクを使用するヘッドユニット３３Ｃを、印刷方向と直交する方向に、Ｍ（マゼンタ）、Ｃ（シアン）、Ｂ（ブラック）、Ｙ（イエロー）の順に並べて第３のヘッドブロック３３を構成している。

【００５１】また、ブラックインクを使用するヘッドユニット３４Ｂ、イエローインクを使用するヘッドユニット３４Ｙ、マゼンタインクを使用するヘッドユニット３４Ｍ、シアンインクを使用するヘッドユニット３４Ｃを、印刷方向と直交する方向に、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）、Ｂ（ブラック）の順に並べて第４のヘッドブロック３４を構成している。

【００５２】前記各ヘッドブロック３１～３４における各ヘッドユニットの配置関係及びノズルのピッチ関係は前述した図３の場合と同様である。そして、前記各ヘッドブロック３１～３４を印刷方向にそれぞれのヘッドユニットが一列に並ぶようにして配置している。すなわち、図８に図７の丸で囲んだX_3の部分を拡大して示すように、第３のヘッドブロック３３のマゼンタインクを使用するヘッドユニット３３Ｍのノズル３５と第４のヘッドブロック３４のイエローインクを使用するヘッドユニット３４Ｙのノズル３６が印刷方向に一列に並ぶように配置している。同様に第１のヘッドブロック３１のブラックインクを使用するヘッドユニット３１Ｂのノズル及び第２のヘッドブロック３２のシアンインクを使用するヘッドユニット３２Ｃのノズルも第３のヘッドブロッ

ク３３のマゼンタインクを使用するヘッドユニット３３Mのノズル３５と印刷方向に一列に並ぶように配置している。

【００５３】このような構成のカラーインクジェットヘッドを使用すれば、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の各色のヘッドユニットが印刷する方向にそれぞれ離れていても印刷する方向と直交する方向に４個配置され、しかも各ノズルがすべてピッチＰの間隔で配列されることになるので、それぞれの色において各ヘッドユニットのノズルからのインク吐出タイミングを制御すればヘッドが１往復動作することでヘッドユニットの略４個分に相当する幅で印刷が行なわれることになり、高速機が実現できる。

【００５４】また、同一構成のヘッドブロックを使用しているので、例えば、ヘッドブロックを１個減らして３個とすれば、この場合にはヘッドが１往復動作することでヘッドユニットの略３個分に相当する幅で印刷が行なわれることになり、標準機が実現できる。さらに、ヘッドブロックを１個減らして２個とすれば、この場合にはヘッドが１往復動作することでヘッドユニットの略２個分に相当する幅で印刷が行なわれることになり、低速機が実現できる。

【００５５】このように、構成が同一で使用するインクの色配列のみが異なるヘッドブロックの使用数を異ならせるのみで高速機、標準機、低速機のヘッドが製造できるので、高速機、標準機、低速機に合わせて専用のヘッドブロックを製造する必要はなく、経済性に優れコストを充分に低減できるカラーインクジェットヘッドが実現できる。また、各ヘッドブロックを印刷方向と直交する方向にずらさずに印刷方向に一列に並べて配置しているので、ヘッド全体の長さを略ヘッドブロックの長さにでき短くできる。

【００５６】なお、このカラーインクジェットヘッドにおいても、マルチドロップ式及びボリュームコントロール式の何れかを適用して階調制御が可能なカラーインクジェットヘッドを実現できる。

【００５７】（第４の実施の形態）この実施の形態は、図９に示すように、同一の長さ、同一のノズル数、同一のノズルピッチからなるインク色の異なるヘッドユニットを４個使用して１つのヘッドブロックを構成し、このヘッドブロックを４個配置して構成している。

【００５８】すなわち、ブラックインクを使用するヘッドユニット４１Ｂ、イエローインクを使用するヘッドユニット４１Ｙ、マゼンタインクを使用するヘッドユニット４１Ｍ、シアンインクを使用するヘッドユニット４１Ｃを、印刷方向（図中矢印Ａの方向）と直交する方向に所定の間隔を開けて、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第１のヘッドブロック４１を構成している。

【００５９】また、ブラックインクを使用するヘッドユニット４２Ｂ、イエローインクを使用するヘッドユニット４２Ｙ、マゼンタインクを使用するヘッドユニット４２Ｍ、シアンインクを使用するヘッドユニット４２Ｃを、印刷方向と直交する方向に所定の間隔を開けて、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第２のヘッドブロック４２を構成している。

【００６０】また、ブラックインクを使用するヘッドユニット４３Ｂ、イエローインクを使用するヘッドユニット４３Ｙ、マゼンタインクを使用するヘッドユニット４３Ｍ、シアンインクを使用するヘッドユニット４３Ｃを、印刷方向と直交する方向に所定の間隔を開けて、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第３のヘッドブロック４３を構成している。

【００６１】また、ブラックインクを使用するヘッドユニット４４Ｂ、イエローインクを使用するヘッドユニット４４Ｙ、マゼンタインクを使用するヘッドユニット４４Ｍ、シアンインクを使用するヘッドユニット４４Ｃを、印刷方向と直交する方向に所定の間隔を開けて、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第４のヘッドブロック４４を構成している。

【００６２】前記各ヘッドブロック４１，４２，４３，４４は、図１０の(a)に示すように、ブロックベース４５の一方の側にブラックインクを使用するヘッドユニット４１Ｂ～４４Ｂ、イエローインクを使用するヘッドユニット４１Ｙ～４４Ｙ、マゼンタインクを使用するヘッドユニット４１Ｍ～４４Ｍ、シアンインクを使用するヘッドユニット４１Ｃ～４４Ｃを配置し、かつ、これら各ヘッドユニットが印刷方向と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並ぶようにしている。

【００６３】そして、図１０の(b)に図１０の(a)の丸で囲んだX_4の部分を拡大して示すように、ブラックインクを使用するヘッドユニット４１Ｂ～４４Ｂの他端のノズル４６とイエローインクを使用するヘッドユニット４１Ｙ～４４Ｙの一端のノズル４７とのピッチが各ヘッドユニット４１Ｂ～４４Ｂ，４１Ｙ～４４Ｙにおけるノズルピッチｐの整数倍、すなわち、ｍ倍となるように、ヘッドユニット４１Ｂ～４４Ｂの他端部とヘッドユニット４１Ｙ～４４Ｙの一端部とが所定の間隔を開けて配置している。

【００６４】これは、イエローインクを使用するヘッドユニット４１Ｙ～４４Ｙの他端のノズルとマゼンタインクを使用するヘッドユニット４１Ｍ～４４Ｍの一端のノズル、並びにマゼンタインクを使用するヘッドユニット４１Ｍ～４４Ｍの他端のノズルとシアンインクを使用するヘッドユニット４１Ｃ～４４Ｃの一端のノズルとの関係についても同様である。

【００６５】そして、前記各ヘッドブロック４１～４４を印刷方向と直交する方向にヘッドユニットの長さよりも短い長さずつ順次ずらして配置している。例えば、図１１に示すように、前記第１のヘッドブロック４１の他端のヘッドユニットであるブラックインクを使用するヘッドユニット４１Ｂの他端のノズル４６と次のイエローインクを使用するヘッドユニット４１Ｙの一端のノズル４７との間に、前記第２のヘッドブロック４２の他端のヘッドユニットであるブラックインクを使用するヘッドユニット４２Ｂの一端側のノズル４８が丁度２個入り、しかも、ノズル４６とノズル４８、ノズル４８とノズル４７のピッチが丁度ヘッドユニットのノズルピッチＰと一致するようにして第２のヘッドブロック４２を配置している。

【００６６】この配置は、前記第２のヘッドブロック４２に対する第３のヘッドブロック４３の配置及び第３のヘッドブロック４３に対する第４のヘッドブロック４４の配置についても同様である。

【００６７】このような構成のカラーインクジェットヘッド１を使用すれば、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の各色のヘッドユニットが印刷する方向にそれぞれ離れていても印刷する方向と直交する方向に４個配置され、しかも各ノズルがすべてピッチＰの間隔で配列されることになるので、それぞれの色において各ヘッドユニットのノズルからのインク吐出タイミングを制御すればヘッド１が１往復動作することでヘッドユニットの略４個分に相当する幅で印刷が行なわれることになり、高速機が実現できる。

【００６８】また、同一構成のヘッドブロックを使用しているので、例えば、ヘッドブロックを１個減らして３個とすれば、この場合にはヘッドが１往復動作することでヘッドユニットの略３個分に相当する幅で印刷が行なわれることになり、標準機が実現できる。さらに、ヘッドブロックを１個減らして２個とすれば、この場合にはヘッドが１往復動作することでヘッドユニットの略２個分に相当する幅で印刷が行なわれることになり、低速機が実現できる。

【００６９】このように、構成が同一のヘッドブロックの使用数を異ならせるのみで高速機、標準機、低速機のヘッドが製造できるので、高速機、標準機、低速機に合わせて専用のヘッドブロックを製造する必要はなく、経済性に優れコストを充分に低減できるカラーインクジェットヘッドが実現できる。

【００７０】また、各ヘッドブロック４１～４４はブロックベース４５の一方の側に各色のヘッドユニットを配置しているので、印字方向の幅を狭くでき、ヘッド全体の幅も狭くできる。

【００７１】なお、このカラーインクジェットヘッドにおいても、マルチドロップ式及びボリュームコントロール式の何れかを適用して階調制御が可能なカラーインクジェットヘッドを実現できる。

【００７２】（第５の実施の形態）この実施の形態は、図１２に示すように、同一の長さ、同一のノズル数、同一のノズルピッチからなるヘッドユニットを４個使用して１つのヘッドブロックを構成し、このヘッドブロックを２個配置してカラーインクジェットヘッドを構成している。

【００７３】すなわち、ブラックインクを使用するヘッドユニット５１Ｂ、イエローインクを使用するヘッドユニット５１Ｙ、マゼンタインクを使用するヘッドユニット５１Ｍ、シアンインクを使用するヘッドユニット５１Ｃを、印刷方向（図中矢印Ａの方向）と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第１のヘッドブロック５１を構成している。

【００７４】また、ブラックインクを使用するヘッドユニット５２Ｂ、イエローインクを使用するヘッドユニット５２Ｙ、マゼンタインクを使用するヘッドユニット５２Ｍ、シアンインクを使用するヘッドユニット５２Ｃを、印刷方向と直交する方向に、Ｂ（ブラック）、Ｙ（イエロー）、Ｍ（マゼンタ）、Ｃ（シアン）の順に並べて第２のヘッドブロック５２を構成している。

【００７５】そして、前記各ヘッドブロック５１，５２を印刷方向と直交する方向に若干ずらして配置している。すなわち、図１３に図１２の丸で囲んだX_5の部分を拡大して示すように、第１のヘッドブロック５１のブラックインクを使用するヘッドユニット５１Ｂのノズル５３と第２のヘッドブロック５２のブラックインクを使用するヘッドユニット５２Ｂのノズル５４が互いにヘッドユニットにおけるノズルピッチＰの１／２だけずれるようにして配置している。

【００７６】従って、第１のヘッドブロック５１の他のヘッドユニット５１Ｙ、５１Ｍ、５１Ｃのノズルと第２のヘッドブロック５２の他のヘッドユニット５２Ｙ、５２Ｍ、５２Ｃのノズルとの関係も同様に互いにヘッドユニットのノズルピッチＰの１／２だけずれるようになる。

【００７７】このようにすれば、第１のヘッドブロック５１による印刷画素の間に第２のヘッドブロック５２による印刷画素が位置することになるので印刷可能なピッチはＰ／２となり、ヘッドブロックの解像度の２倍の解像度での印刷が可能になる。このように、同一構成のヘッドブロックを２個使用することで高解像度機が容易に実現できる。また、ヘッドブロックを１個のみ使用すれば低解像度機が実現できる。

【００７８】また、このようなヘッドブロックを３個使用し、各ヘッドブロックを互いのノズル間のピッチがノズルピッチＰの１／３だけずらして配置すれば印刷可能なピッチはＰ／３となり、さらに解像度を高めることができる。すなわち、ヘッドブロックをｎ（但し、ｎは２

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以上の整数）使用して解像度が１つのヘッドブロックのｎ倍のヘッドを実現するには、各ヘッドブロックを互いのノズル間のピッチがヘッドユニットのノズルピッチＰの１／ｎだけずらして配置すればよい。

【００７９】このように、構成が同一のヘッドブロックの使用数を異ならせるのみで高解像度機や低解像度機など各種の解像度の異なるヘッドが製造できるので、経済性に優れコストを充分に低減できるカラーインクジェットヘッドが実現できる。

【００８０】なお、このカラーインクジェットヘッドにおいても、マルチドロップ式及びボリュームコントロール式の何れかを適用して階調制御が可能なカラーインクジェットヘッドを実現できる。

【００８１】

【発明の効果】各請求項記載の発明によれば、同一構成のヘッドブロックを複数個使用して高速機、標準機、低速機や高解像度機、低解像度機などを容易に実現でき、経済性に優れコストを充分に低減できる。

【図面の簡単な説明】

【図１】本発明の第１の実施の形態に係る印刷部の要部構成を示した斜視図。

【図２】同実施の形態におけるカラーインクジェットヘッドの概略構成を示す図。

【図３】同実施の形態におけるヘッドブロックの構成を示す図。

【図４】同実施の形態における各ヘッドブロック間のノズル位置関係を説明するための図。

【図５】本発明の第２の実施の形態におけるカラーインクジェットヘッドの概略構成を示す図。

【図６】同実施の形態における各ヘッドブロック間のノズル位置関係を説明するための図。

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【図７】本発明の第３の実施の形態におけるカラーインクジェットヘッドの概略構成を示す図。

【図８】同実施の形態における各ヘッドブロック間のノズル位置関係を説明するための図。

【図９】本発明の第４の実施の形態におけるカラーインクジェットヘッドの概略構成を示す図。

【図１０】同実施の形態におけるヘッドブロックの構成を示す図。

【図１１】同実施の形態における各ヘッドブロック間のノズル位置関係を説明するための図。

【図１２】本発明の第５の実施の形態におけるカラーインクジェットヘッドの概略構成を示す図。

【図１３】同実施の形態における各ヘッドブロック間のノズル位置関係を説明するための図。

【図１４】従来のカラーインクジェットヘッドの一構成例を示す図。

【図１５】従来のカラーインクジェットヘッドの他の構成例を示す図。

【符号の説明】

１…カラーインクジェットヘッド

１１～１４…ヘッドブロック

１１Ｂ，１２Ｂ，１３Ｂ，１４Ｂ…ブラックインクを使用するヘッドユニット

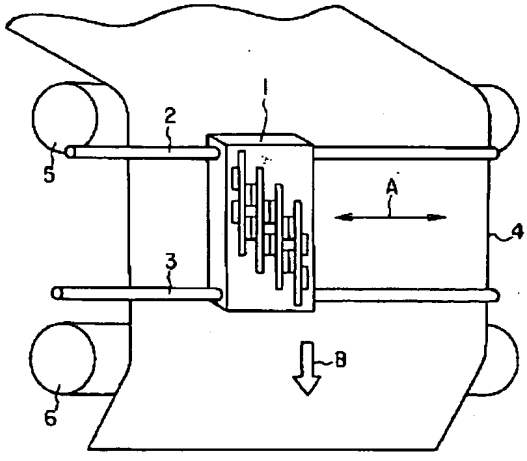
１１Ｙ，１２Ｙ，１３Ｙ，１４Ｙ…イエローインクを使用するヘッドユニット

１１Ｍ，１２Ｍ，１３Ｍ，１４Ｍ…マゼンタインクを使用するヘッドユニット

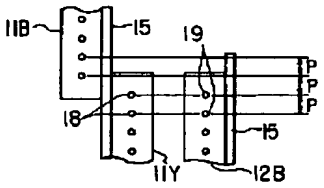
１１Ｃ，１２Ｃ，１３Ｃ，１４Ｃ…シアンインクを使用するヘッドユニット

１６，１７，１８，１９…ノズル

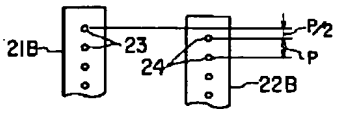
【図１】



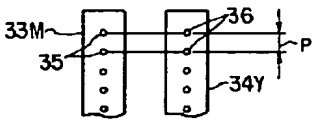
【図４】



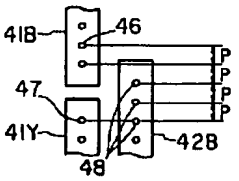
【図６】



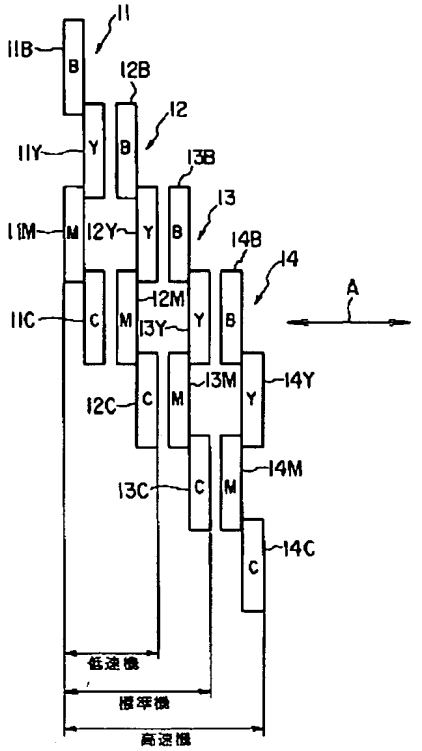
【図８】



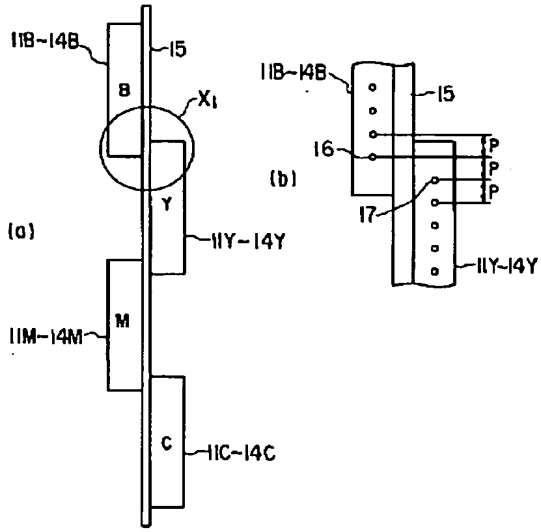
【図１１】



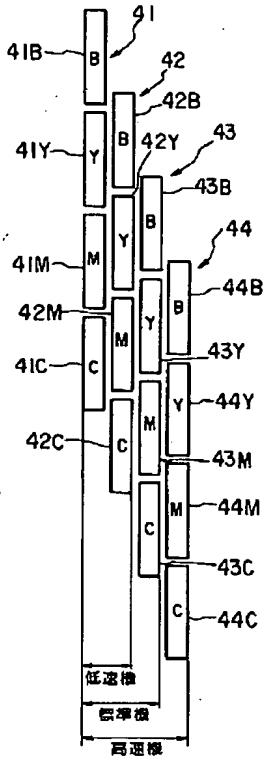
【図２】



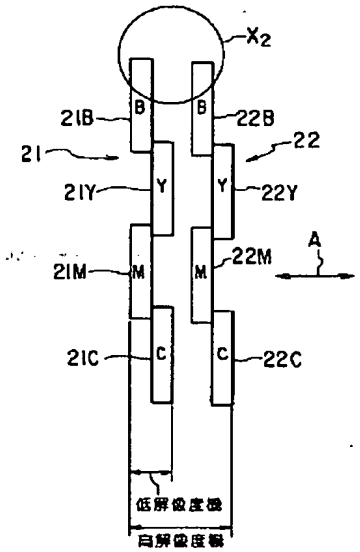
【図３】



【図９】



【図５】



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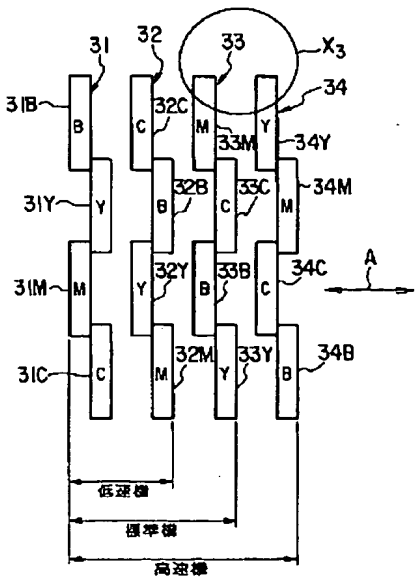
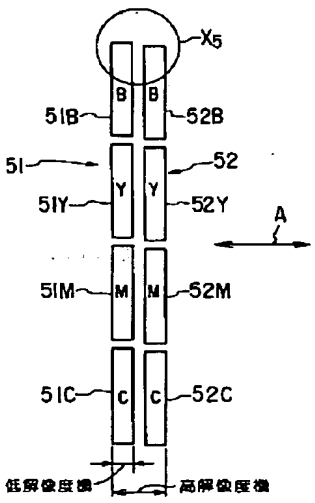
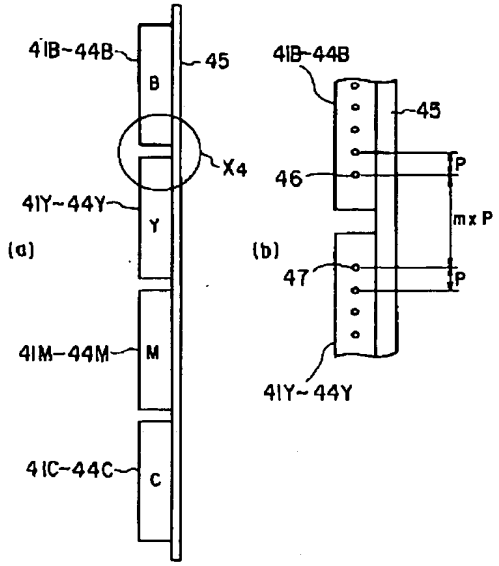


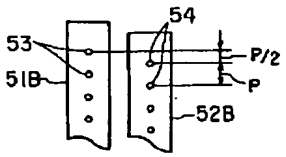
【図１２】



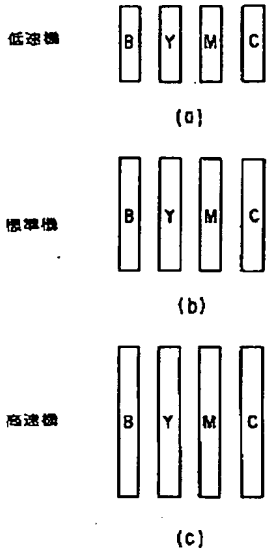
【図１０】



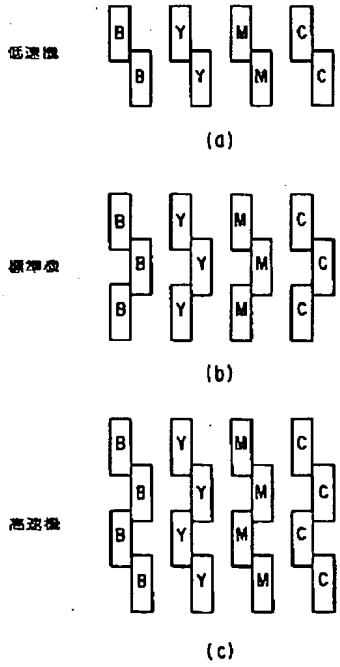
【図１３】



【図１４】



【図１５】



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